

60 MPH OUT OF THE BOX! TEAM GS SONIC

RADIO CONTROL

car action

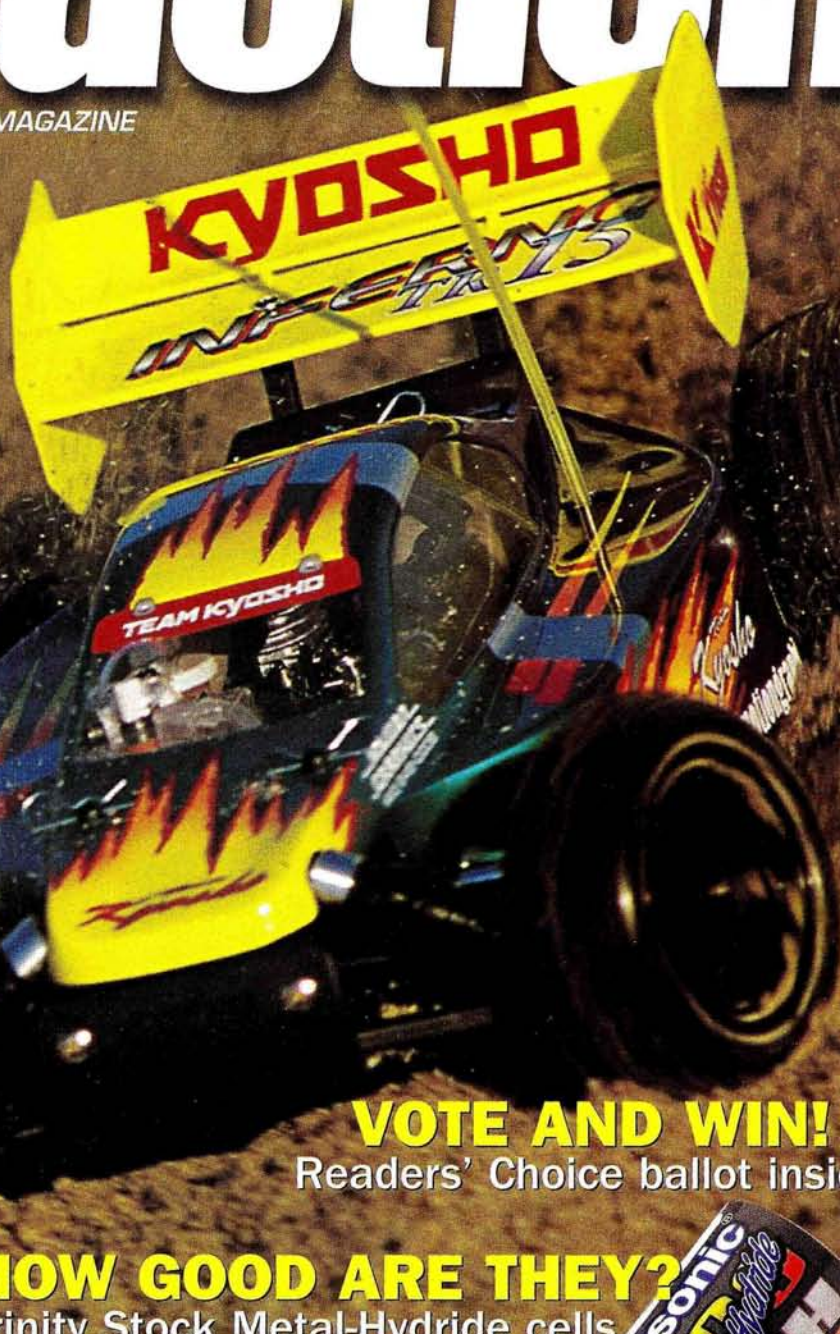
THE WORLD'S BEST-SELLING RC CAR MAGAZINE

6 EASY HOW TO's

Install a
tuned pipe

Power up
your motor

Build better
shocks
and more!



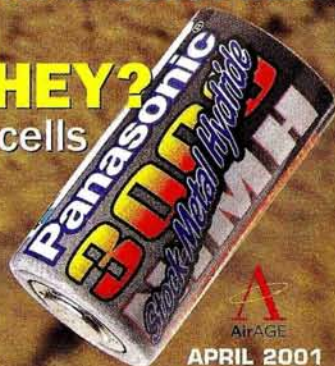
Kyosho Inferno TR 15

VOTE AND WIN!

Readers' Choice ballot inside

HOW GOOD ARE THEY?

Trinity Stock Metal-Hydride cells



APRIL 2001

20 REVERSING SPEED CONTROLS

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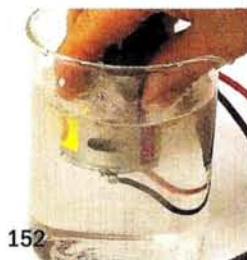
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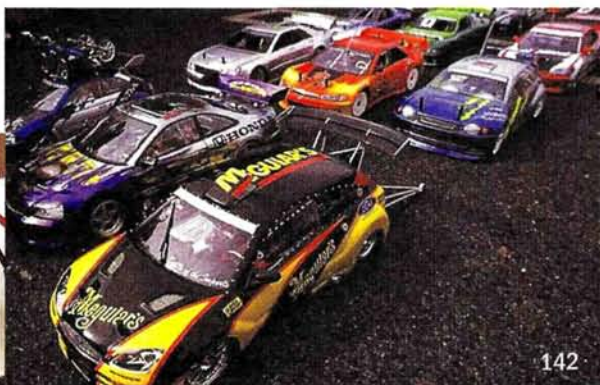


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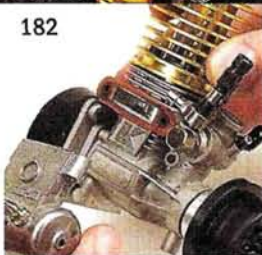
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ON THE COVER: Kyosho's Inferno TR 15 throws roost from all four corners; the new King of Cells; Panasonic's Stock Metal Hydride (inset). All photos by Walter Sidas.

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Be Heard!

It's time to vote again! In this issue, you'll find the 2001 Readers' Choice ballot, and we hope you'll take a few minutes to fill it out; it's always fun to brainstorm on which products are the best in RC, and you just might win one of the vehicles that you and your fellow readers pick as number one.

Longtime Readers' Choice voters will notice some changes to the ballot. With nitro-powered RC becoming ever more popular, we decided to make the ballot a little less general in scope. In addition to a new "fuel" category, you can now vote for your favorite nitro-powered truck and your favorite electric-powered truck. Likewise, buggies are divided into "nitro" and "electric" flavors and so are touring and on-road cars ("on-road" means any non-dirt car; if you want to vote for a pan car, that's the place to do it).

So, how do you decide which to vote for? The criteria you follow are entirely up to you. If you want to vote for products that you feel offer the best combination of quality, features and value, go for it. If you base your selections on which products you think perform best, that works too. Or perhaps you just want to pick the items that simply press your gotta-have-it button—feel free. I think that's how most of us play the game. You say, "If I won the lottery and could buy anything I see in *Car Action*, I would buy ..., " and then you flip through the pages one by one, filling up your fantasy shopping cart.

We just want to know what you like best; it doesn't matter if the product is old or new (or even available yet; last year, you picked the Trinity/Picco .15 engine as your favorite before it was even on the shelves!). We just want to know what you're into. It helps us decide the types of articles we should write, and you'd better believe that the industry cares what you're thinking! You steer the ship; the manufacturers will produce the kits and products that you tell them to make—just as we at *Radio Control Car Action* strive to give you the information that you tell us you want.

So that's my message: be heard. Cast a vote. You're the most important person in RC!

Peter Vieira
Executive Editor

RADIO CONTROL car action

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Save the Minis!

Since HPI has decided to discontinue the RS4 Mini, what do you guys think will be the next trend as an alternative to 1/12-scale pan cars for indoor roadcourse carpet tracks? I love racing my HPI RS4 Mini at my local indoor track, but if parts become a rarity and the cars simply disappear from the winter racing season, I fear this type of racing will become obsolete. I really wish that HPI would reconsider eliminating this fine product. The RS4 Mini is fun to drive, very durable and great for small indoor tracks. Best of all, it uses all the same electronics as my touring car. Why, HPI? Why? *ALBERT VENDITTI Staten Island, NY*

Don't worry, Albert; HPI will still support the Mini line with parts. But I think you'll want to trade in your Mini for something even smaller from HPI: the new Micro RS4. The 1/18-scale, 4WD, AA-powered cars were shown in prototype form in the January 2001 issue of *RC Car Action*, and they could be the Next Big Thing for small-scale indoor action. Best of all, the Micro RS4 will accept all the same electronics as your touring car. If you can't wait for the Micro, try Kyosho's Mini-Z lineup, and the BRP Fun Won pan-style cars are a blast.

—Pete



KYOSHO MINI-Z

Rustler Racer

I read your magazine until it falls apart! I drive a stock Traxxas Rustler, and I have a blast. I recently decided to race it at an off-road track. After running it outside on a couple of Dynamite 1500 packs, I started thinking my truck might need some hop-ups to be competitive. Any suggestions? [email] *JAY BAUGHMAN*

If you want to make a real go of it, I suggest you get ball bearings for the hubs (the transmission already has bearings), a good 2000 or 2400mAh pack, a competition stock motor (so you can race stock class) and a forward-only ESC. You should also get the correct tires, springs and gearing to suit your track; the track owner should be able to help you out with that. Keep in mind that you don't have to get this stuff all at once; you can continue to have fun racing your truck

bone-stock, as is. But if you want a shot at the A-main, you'll want to upgrade. —Pete

USA-1 Scores

I've been hoping you guys would do a USA-1 project for a while now, and Greg really came through ("Project USA-1," February 2001 issue)! I'm surprised Kevin didn't do it first—or is he just a Clod boy? Anyway, I think the truck came out great, but I have one question: were the motors wired in parallel or in series? [email] *ROGER WEAVER*

To maintain maximum rpm (but at the expense of run time), Greg wired the motors in parallel. There's room in the Sassy Chassis conversion to mount two battery packs and wire them in parallel to bring the run time back up. Or, you could install the Traxxas Vx12 ESC from the E-Maxx and run the packs in series for 14.4 volts of power—how cool would that be? —Pete

Traxxas Tech's "Pit Tips" Points

Hey, *RC Car Action* guys! We enjoyed the February 2001 issue, but your readers should know a

few things before they pop the carb restrictor out of their Nitro Sports, as Craig Trachten suggested in his "Leaner Nitro Sport" blurb in "Pit Tips." Removing the



restrictor will allow more air into the carburetor and temporarily increase performance by making the engine run leaner (due to a lower fuel-to-air ratio). This ratio must be corrected by opening the

needle valve counterclockwise to richen the mixture. If you don't richen the mixture, the engine may overheat, and that can cause serious damage. It's also a very good idea to install the optional slipper clutch to protect your truck's drive-train parts if you take the restrictor out of your Nitro Sport. If any of your readers have additional questions, they can reach Traxxas tech support at www.traxxas.com, or they can call us at (888) TRAXXAS; we'll be glad to help. [email] *YOUR FRIENDS IN THE TRAXXAS TECH-SUPPORT CREW*

I've always heard good things about you Traxxas guys; now I know why. Thanks for filling everyone in. —Pete

YOU SAID IT

"Lately, it seems as if RC just isn't my thing"

I have recently had problems with my home-built Clod Buster, and I've been wishing I had just gotten a Clodzilla or a JPS chassis instead of creating one myself. My T3 Sport is also in bad shape; it's cracked in the front and has stripped holes for the top plate screws. Today, I faced my worst problem. I recently purchased an ESC off the Internet, and when I hooked it up, it began smoking and burning the Tamiya connectors. I quickly disconnected it, and I feared my battery pack might have been harmed, but it wasn't (probably the only luck I've had all day). After I removed my cooked Tamiya plugs, I accidentally knocked my dad's professional-type soldering gun to the ground, and that ripped the screws out of their holes and bent the soldering tip. Lately, it seems as if RC just isn't my thing. I'd really appreciate any help you and the guys could give me. Thanks for taking the time to read this and for the great mag. [email] *JAY*

It sounds as though you need to do a reset. Put your trucks on the shelf, and clean and organize your shop. Wipe down your tools, clear off your bench, sort your screws and nuts, file your decals and manuals, sweep the floor, put up a new shop light and do whatever else you need to do to feel completely ready to take on your trucks. When all your stuff is neat and organized, you'll be totally pumped to start wrenching, and you'll be far less likely to knock stuff off your bench (like your dad's soldering iron). I do a reset about once a month, and it never fails to fan my RC flames.

Jay, I'm sending you an LRP ESC to replace the one you fried, along with some decals and a T-shirt. Keep the faith! —Pete



WRITE TO US! We welcome your photos, drawings, comments and suggestions. Letters should be addressed to "Letters," Air Age Inc., Radio Control Car Action, 100 East Ridge, Ridgefield, CT 06877-4606 USA. Letters may be edited for clarity and brevity, and each must include a full name and address or telephone number so that the identity of the sender can be verified. We regret that, owing to the tremendous numbers of letters we receive, we can't respond to every one.

EMAIL ■ Derek Buono: derekb@airage.com ■ Chris Chianelli: chrisc@airage.com ■ Bob Hastings: bobh@airage.com ■ Kevin Hetmansk: kevinh@airage.com ■ Steve Pond: stevep@airage.com ■ Peter Vieira: peterv@airage.com ■ Greg Vogel: gregv@airage.com



BY CHRIS
CHIANELLI
& PETER
VIEIRA

DAY-OH, MON-DE-O HPI BTCC FORD MONDEO BODY

APOLOGIES TO HARRY BELAFONTE. The newest HPI touring car shell fits all 190mm tourers, includes a giant vinyl decal sheet with the Rapid Fit logos shown here and the usual window masks and overspray film. Like some of HPI's other recent releases, the Mondeo includes a scale rear wing as well as a larger, non-scale wing for racing use.

HPI Racing, 15321 Barranca Pky., Irvine, CA 92618; (949) 753-1099; fax (949) 753-1098; www.hpiracing.com.



WORLD CHAMP IN A BOX! KYOSHO YUICHI KANAI EDITION MP 7.5

Here's a marketing move that's carved in stone: when your driver wins the world championship, release a signature edition! Kyosho is applying this proven formula to the highly successful Inferno MP 7.5 by introducing the Yuichi Kanai edition, which is probably the most authentic "signature" car going, since Yuichi designed the original 7.5 in the first place. The changes and upgrades from standard 7.5 to signature edition are far too numerous to list here, but the biggies are: machined engine mount, universal center shafts and rear axles, turnbuckle camber links and upper rods, quad disc brakes and new-style front shock tower—plus a ton of other stuff. For the complete list of changes, check out www.caraction.com.

Kyosho; distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948.



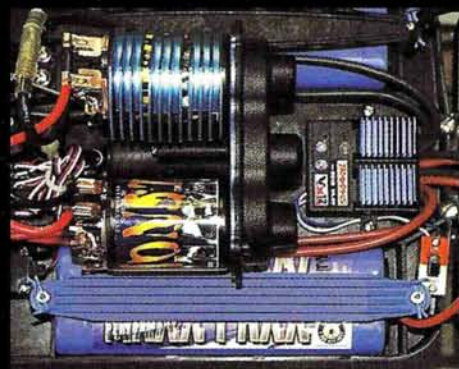
WHEEL-STANDING OVATION TRINITY WHEELIE BARS AND BATTERY STRAPS FOR TRAXXAS E-MAXX

Everyone knows the E-Maxx does wheelies like there's no tomorrow, so it only makes sense to have a wheelie bar on the back of your Maxx. Trinity's machined-aluminum rig is adjustable, has O-ring "tires" and can be bolted on in about three minutes. It works, too; we carried the front end all the way down the hall with ease, much to the annoyance of the accounting department, who seem to feel the office is a place of business.

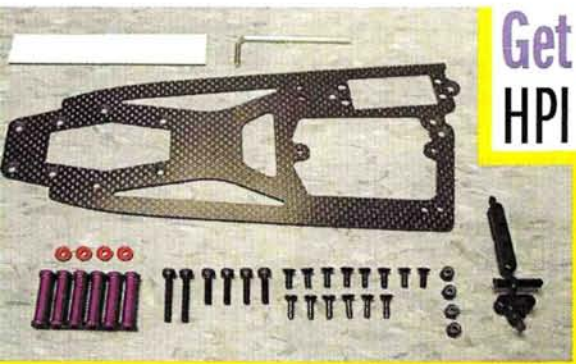
What's up with that?

The wheelie bar is pretty cool, but Trinity also has some new hop-ups to keep your E-Maxx cool, temperature-wise—especially if you're bolting in aftermarket motors. The heat-sink battery straps, motor heat sinks, and heat-sink motor plate (tough to see, but it's there) all help hold down heat while dressing up your machine.

Trinity Products Inc., 36 Meridian Rd., Edison, NJ 08820; (732) 635-1600; fax (732) 635-1640; www.teamtrinity.com.

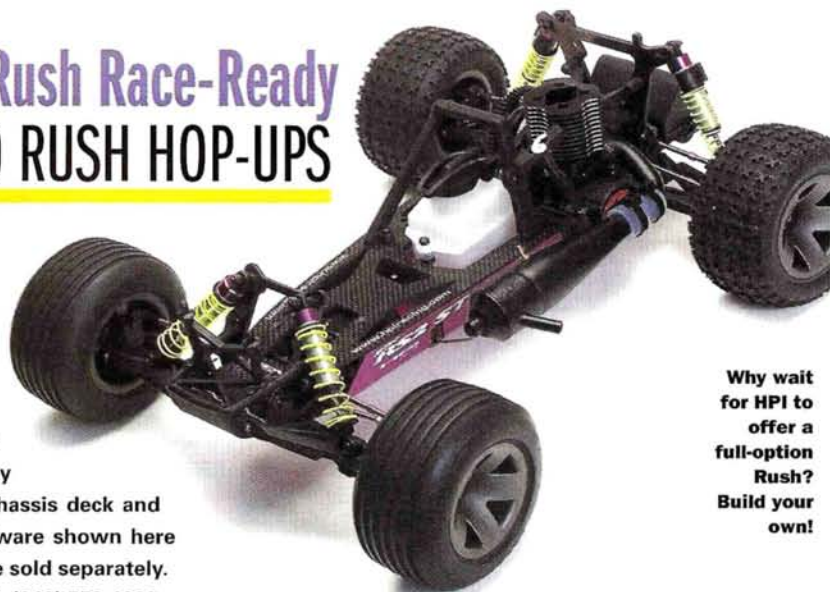


Get your Rush Race-Ready HPI NITRO RUSH HOP-UPS



If you've been lusting for a decked-out Rush since you spotted the full-option truck in the January issue, you'll be glad to know that the graphite chassis deck and shock towers are here at last. You get all the hardware shown here (yes, even the purple stuff), and the shock towers are sold separately.

HPI Racing, 15321 Barranca Pky., Irvine, CA 92618; (949) 753-1099; fax (949) 753-1098; www.hpiracing.com.



Why wait for HPI to offer a full-option Rush? Build your own!



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the legend returns! the most popular sport battery pack ever produced for R/C racing is back and it's now packing 1400 mAHs of raw power, and a new lower price!
RC5922, \$18.99



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***** 5 Stars

"Better than the original, more action and a lower cost!"

TIME WARP EXTENDED PLAY 1900MAH STICK PACKS

EVERY ZIPPY INTRO I THOUGHT OF FOR Trinity's long-duration Time Warp pack came out sounding like an ad for some kind of male potency medication, so I'll just keep it simple: the new packs have 1900mAh capacity for plenty of run time, and since they're Ni-Cd cells, you can charge them on any RC battery charger. 'Nuff said!

Trinity Products Inc., 36 Meridian Rd., Edison, NJ 08820; (732) 635-1600; fax (732) 635-1640; www.teamtrinity.com.

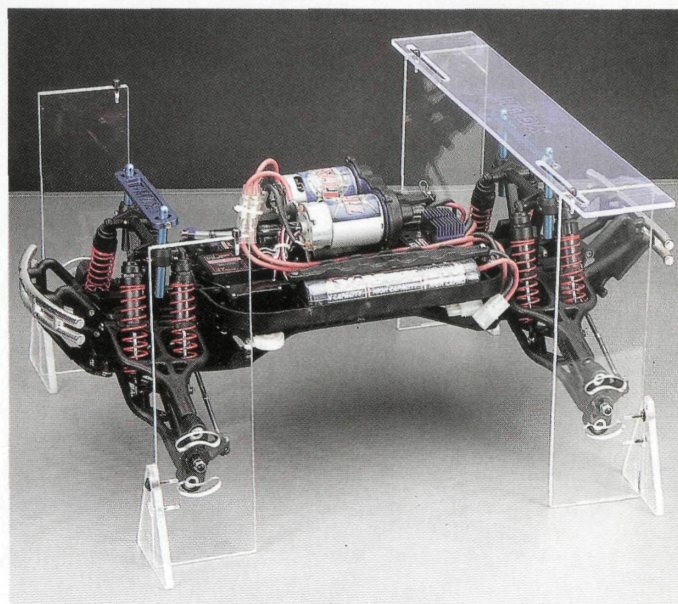


IT'S A SETUP!

HUDY SETTING SYSTEM FOR TRAXXAS MAXX TRUCKS

The Hudy setting system is the most precise way to set up touring and on-road cars; now Traxxas Maxx trucks can also be dialed in with the system. The gauge plates are machined from solid acrylic, are finely scribed with measurement marks and are designed expressly for the big Traxxas trucks. The Hudy system makes it easy to measure camber, toe-in and track, and thanks to openings that allow pivot-ball access, you can adjust the suspension with the gauge plates in place. Maxx setup doesn't get any more precise than this.

Hudy Special Products; team@hudy.net, distributed by Serpent Inc. USA; (305) 639-9665; fax (305) 639-9658; info@serpent-usa.com.



PLUG & PLAY LONGER FOR LESS



1900 mAh Ni-Cd Extended Capacity Racing Pack For Stock & Modified Motors

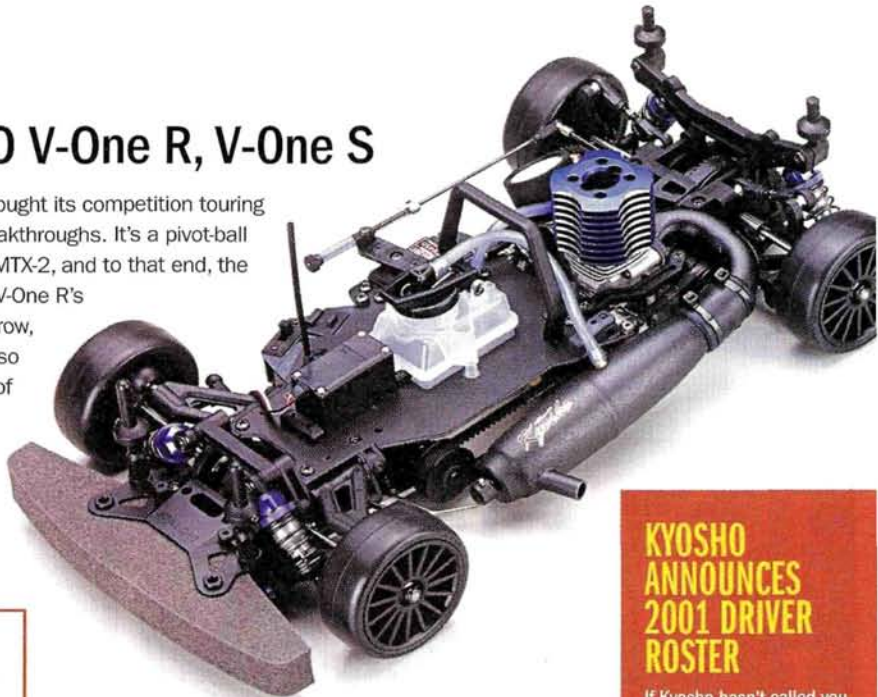
RC5897. \$36.99



COMPETITION K-CAR KYOSHO V-One R, V-One S

From the looks of the new V-One R platform, Kyosho has brought its competition touring car up to spec with the latest suspension and chassis breakthroughs. It's a pivot-ball car designed to run with the Serpent Impulse and Mugen MTX-2, and to that end, the V-One R borrows from Kyosho's 1/8-scale on-road Phantom. The V-One R's 2-speed transmission is identical to the Phantom's, and the narrow, 3mm duralumin chassis is also on-road inspired. It's a race kit, so no engine is included, but there are plans for a "sport" version of the car (the V-One S) that will feature a GS15R engine, a 3mm aluminum chassis and a choice of bodies, including a D2 AMG Mercedes CLK, Castrol Mugen NSX, Corvette CFR and McLaren BMW F-1 GTR.

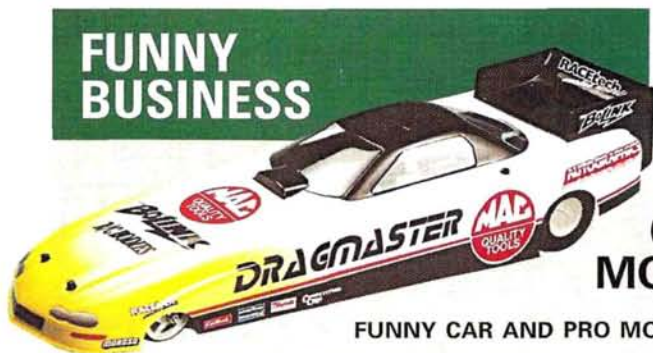
Kyosho; distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948.



KYOSHO ANNOUNCES 2001 DRIVER ROSTER

If Kyosho hasn't called you yet, it looks as though you didn't make the team! Don't sweat it; not many of us can run with these guys. Current team drivers Greg Degani and Jeremy Kortz are joined by Gene Hickerson (fresh from Team Losi) and Andy Smolnick (formerly with Associated) and will run all of Kyosho's vehicles. Mark Pavidis and Brian Kinwald have signed on to run the Inferno MP 7.5 (but are otherwise sticking with Associated and Team Losi vehicles, respectively), and Josh Cyrul will be running all classes with Kyosho vehicles, except for electric sedan (he's a Yokomo driver in touring car class).

FUNNY BUSINESS



BOLINK CAMARO FUNNY CAR AND '63 'VETTE PRO MODIFIED BODIES

FUNNY CAR AND PRO MOD FANS: Bolink has your number. The Corvette body is patterned after the most popular ride in the IHRA's Pro Mod class and is designed to fit cars with 10- to 11-inch

wheelbases, such as the Bolink Pro Stock and Dragmaster-brand kits, also available from Bolink. The Camaro funny car fits electric and nitro-powered funny-car chassis with 13-inch wheelbases; once again, Bolink has you covered with cheap-and-fast electric- and nitro-powered funny-car kits as well as no-holds-barred Dragmaster funny-car chassis kits. Bolink is pretty much Drag Racing Central these days!

Bolink R/C Cars Inc., 420 Hosea Rd., Lawrenceville, GA 30045; (770) 963-0252; fax (770) 963-7334; www.bolink.com.



ASSOCIATED TEAM BUILT KITS

Wrenches? We don't need no stinking wrenches!

Looks as if the era of kit-building is that much closer to an end now that Associated has announced its Team Built line, which kicks off with the RC10GT and RC10T3 trucks. The new models aren't RTRs; they're simply factory-assembled GT and T3 kits. Notice that I didn't say "versions of ..."; the Team Built kits use the same American-made parts as the you-build-it kits. Still, there are some changes: the Team Built models' shocks are blue-anodized rather than hard-anodized, and the trucks have dog-bones instead of universals. You also get a painted body, full bearings and Pro-Line tires. The pictured truck is a kit T3; Team Built pre-painted bodies will have different graphics and blackout windows.

Associated Electrics, 3585 Cadillac Ave., Costa Mesa, CA 92626-1403; (714) 850-9342; fax (714) 850-1744; www.rc10.com; www.teamassociated.com.

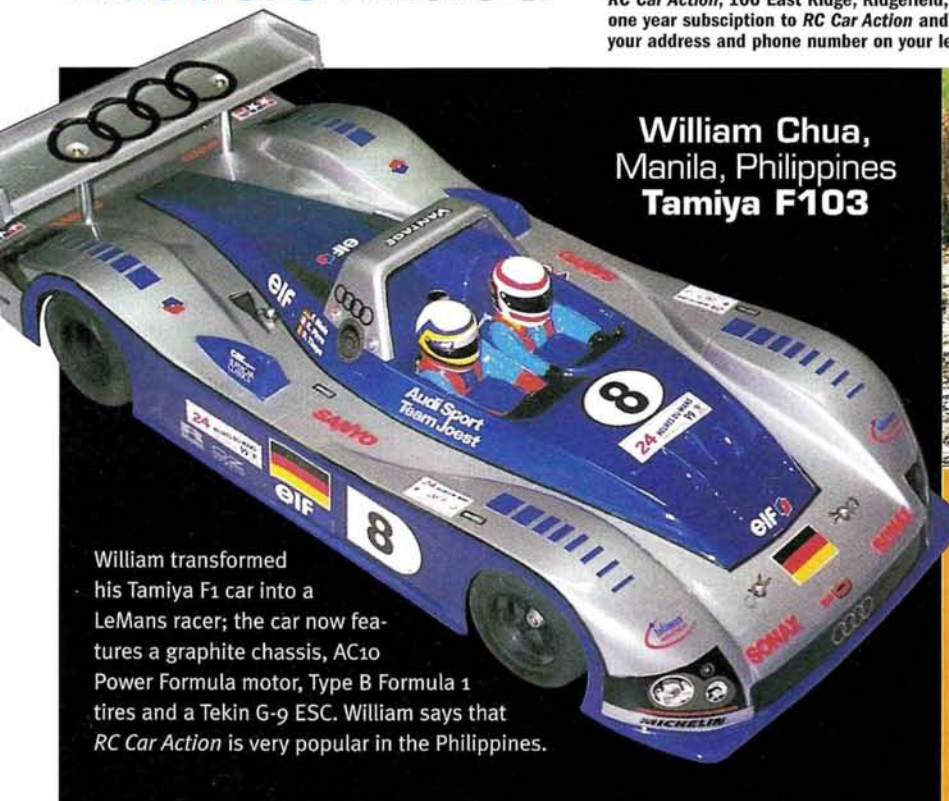


Worlds-winning Reedy Power COMING SOON

In other Associated news, Mike Reedy of Reedy Modifieds announced the imminent release of a new mod-motor lineup. The forthcoming Ti motors will feature a faux titanium finish (hence the name), Millennium winds like those used to win the IFMAR On-Road Worlds, all-new magnets and other features. Look for a photo and more info in the next "Inside Scoop." ■

Readers' Rides

Win a one year subscription to **Radio Control Car Action** magazine! Send a sharp, uncluttered, well-exposed color photo of your vehicle (no Polaroids), and a brief description, to Readers' Rides, **RC Car Action**, 100 East Ridge, Ridgefield, CT 06877-4606 USA. If we publish your photo, you'll receive a free one year subscription to **RC Car Action** and will be eligible to win the "Readers' Rides of the Year Contest". Write your address and phone number on your letter and on the back of every photo you send. Good luck!



**William Chua,
Manila, Philippines
Tamiya F103**

William transformed his Tamiya F1 car into a LeMans racer; the car now features a graphite chassis, AC10 Power Formula motor, Type B Formula 1 tires and a Tekin G-9 ESC. William says that **RC Car Action** is very popular in the Philippines.



**Adam Ball, Jarrettsville, MD
OFNA Monster Blazer**

This monster's makeover starts off with an F-150 body from the HPI Super RS4. Adam backs up the truck's good looks with an OFNA P4 engine outfitted with a 12-tooth clutch bell, full steel gearing, a center diff-bypass unit, ball-bearing steering and Hitec servos. He uses a Futaba 3PD radio for control.

**Rick Isi, Petaluma, CA
Team Associated RC-10**

Rick had this original, gold chassis RC-10 sitting on a shelf for all to admire, but he couldn't let this off-road legend just sit there. He rebuilt his buggy using an O.S. CZ engine and parts from a Kyosho Assault and has given his classic a new lease on life.



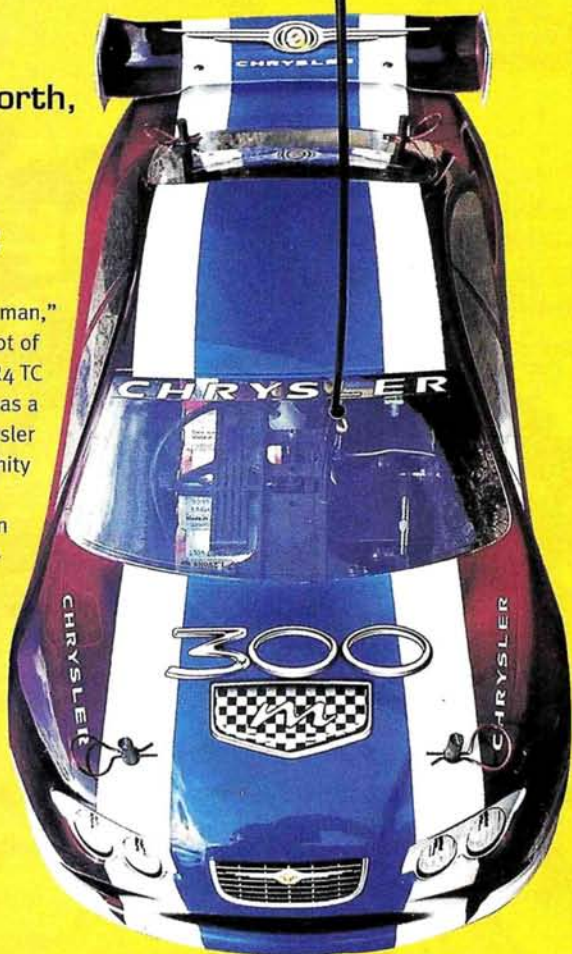
**Rafael Baggio,
Curitiba, Brazil
Serpent Impulse**

Rafael is quite proud of his Serpent Impulse; he's presently leading his state's championship with this car. The racer, which he calls his "little snake," (we didn't ask why) is equipped with an HPI Toyota Celica body and a Mega SX-12 engine, and it's controlled by a KO Propo EX-11 radio.

Readers' Rides

Mark Wordsworth, Surrey, England Yokomo MR4 TC Pro

Mark, "The Lazman," sent us this shot of his Yokomo MR4 TC Pro; his racer has a Protoform Chrysler 300 body, a Trinity Monster Stock Junior motor, an LRP speed control and Peak 2400 matched cells.



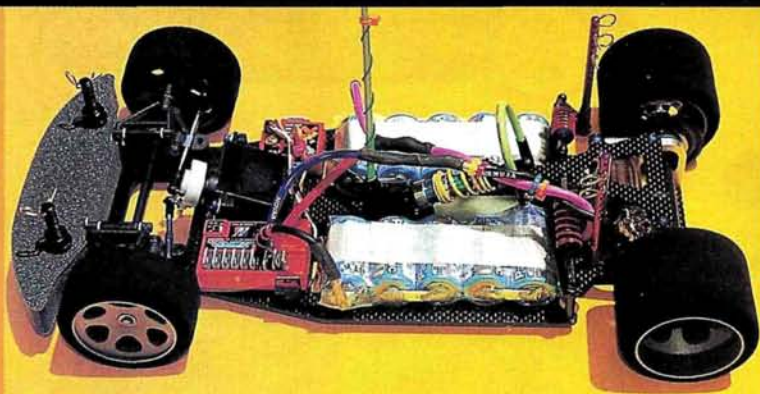
Michael Constantinides, Chicago, IL Team Associated RC-10GT

Michael has a blast in the backyard with his RC-10GT, and he now plans to make the transition to his local track. He uses Futaba radio gear, an O'Donnell racing head on his O.S. 12 CV engine, Pro-Line tires and MIP ball-bearing steering, boost bottle, temperature gauge and clutch.



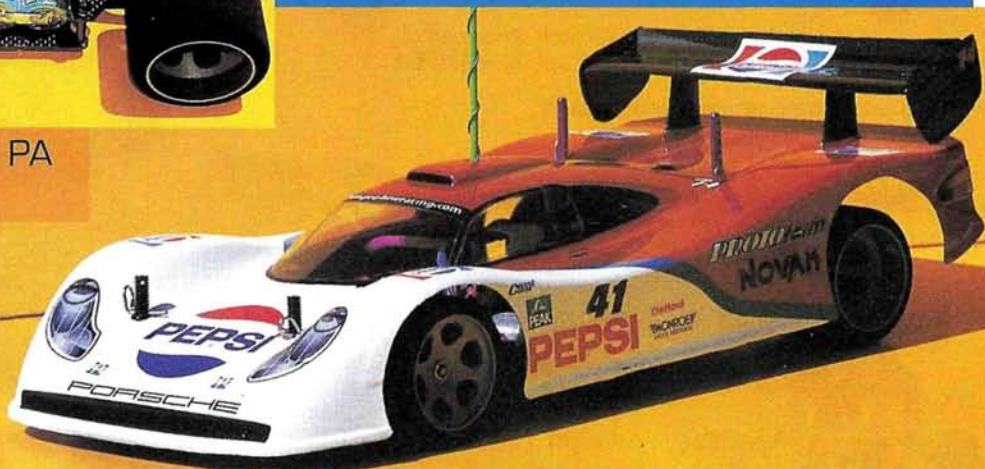
Curt Bartel, Oconomowoc, WI Traxxas Stampede

Andrew and Brandon show off the family's RC truck; this Traxxas Stampede features a Pro-Line Silverado body, RPM Slingshot rims and Futaba radio gear. The truck's drive train is stock with the exception of a full bearing upgrade.



Richard Lehman, Pittsburgh, PA Team Associated RC-10 L3

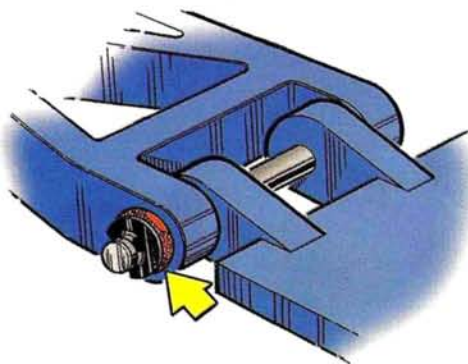
There's no shortage of speed here; Richard's Team Associated L3 is powered by a 7-turn Trinity D3.5 on 10 3000mAh cells. A Novak XXL receiver and a Tempest Max ESC control the flow of all 110 volts. That's a lot of power!



Pit Tips

BY JIM NEWMAN

WIN AN OFNA Z-10 RALLY! Radio Control Car Action will give a 6-month subscription (or extend an existing subscription) to the author of each idea used in "Pit Tips." "Top Tip" winners receive an OFNA Z-10 Rally kit. All published "Pit Tip" authors receive an OFNA yo-yo. Send a rough sketch to Bob Hastings c/o Radio Control Car Action, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. We're unable to publish many good tips because we don't have the sender's name and address. Please note: because of the number of ideas we receive, we can neither acknowledge every one nor return unused material.

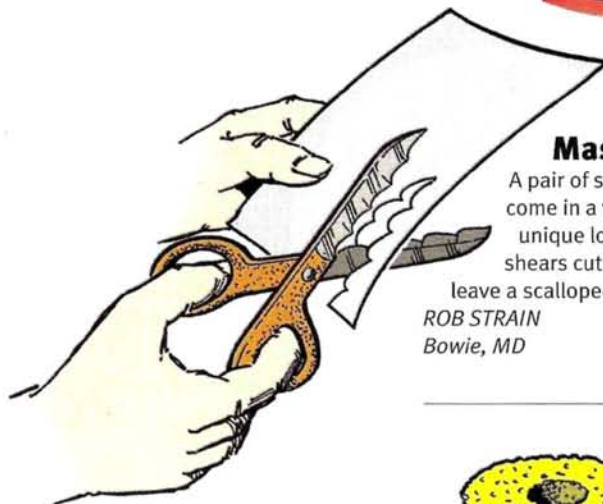


Hinge-Pin Shim

Tired of losing hinge pins? Use a rubber O-ring to prevent them from shifting in their holes and working the E-clips loose.

JEFF YOUNG

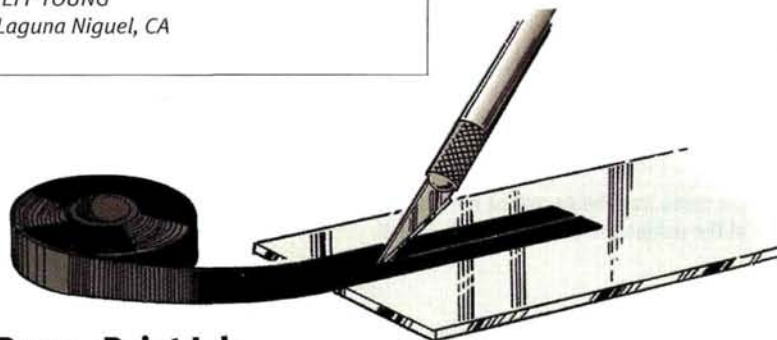
Laguna Niguel, CA



Masking Marvel

A pair of shaped pinking shears (they come in a variety of designs) can add a unique look to your paint masks. The shears cut like regular scissors but leave a scalloped or toothed edge.

ROB STRAIN
Bowie, MD

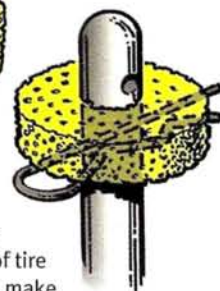
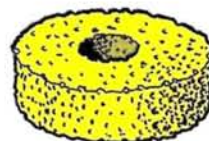


Proper Paint Job

Nothing is more annoying than paint bleeding under your masking tape and ruining your paint job. Next time, try some high-quality-vinyl electrical tape. It is made of a similar material as commercially available masks and sticks securely to Lexan.

PETE WRIGHT

York, PA



Clip Cushion

The area around body posts often gets scuffed when the body scrapes the top of the body clips. To cushion the area, cut a small piece of tire foam to size, and with a hole punch, make a hole that will fit snugly on the post.

JOSE DURAN

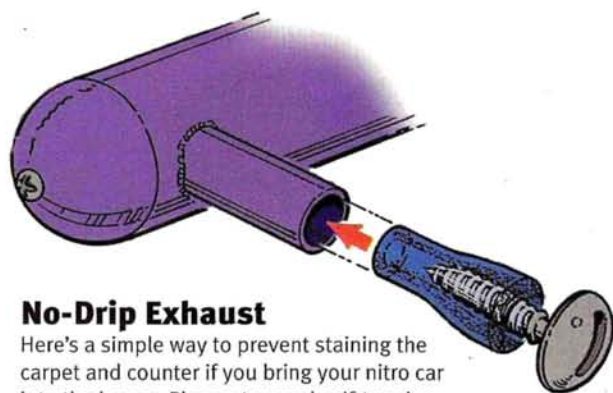
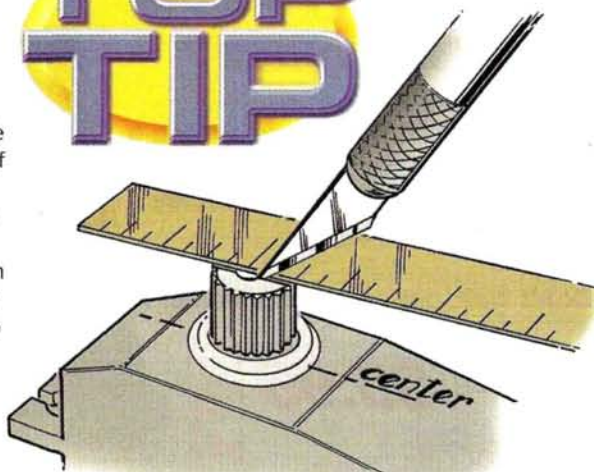
Bronx, NY

TOP TIP

Servo Center

Use a hobby knife to mark the top of your servo's output spline so you know where the center orientation is. This will make subsequent radio installation a breeze.

CARL BOURGES
Phoenix, AZ



No-Drip Exhaust

Here's a simple way to prevent staining the carpet and counter if you bring your nitro car into the house. Place a tapered self-tapping screw inside a length of fuel tubing and insert it into the exhaust outlet. The screw taper will make the tubing fit snugly, and the head provides a convenient handle to remove it when it's time.

DAN WINN

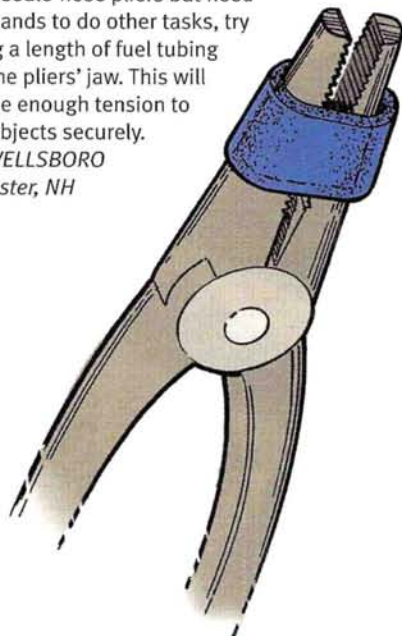
Gainesville, GA

Pit Tips

Hands-free Holding

If you must hold small parts in your needle-nose pliers but need your hands to do other tasks, try sliding a length of fuel tubing over the pliers' jaw. This will provide enough tension to hold objects securely.

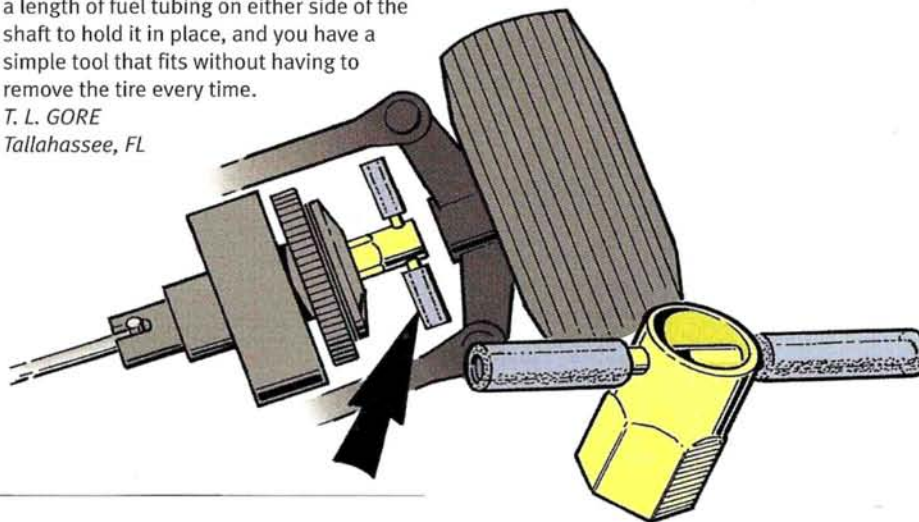
LOU WELLSBORO
Rochester, NH



Easy-Slipper Access

Tired of removing your wheels to adjust the slipper? Find the appropriate size socket to fit your slipper nut, and cross-drill it to accommodate a handle made of an old hinge pin, a shock shaft, or thick music wire. Slide a length of fuel tubing on either side of the shaft to hold it in place, and you have a simple tool that fits without having to remove the tire every time.

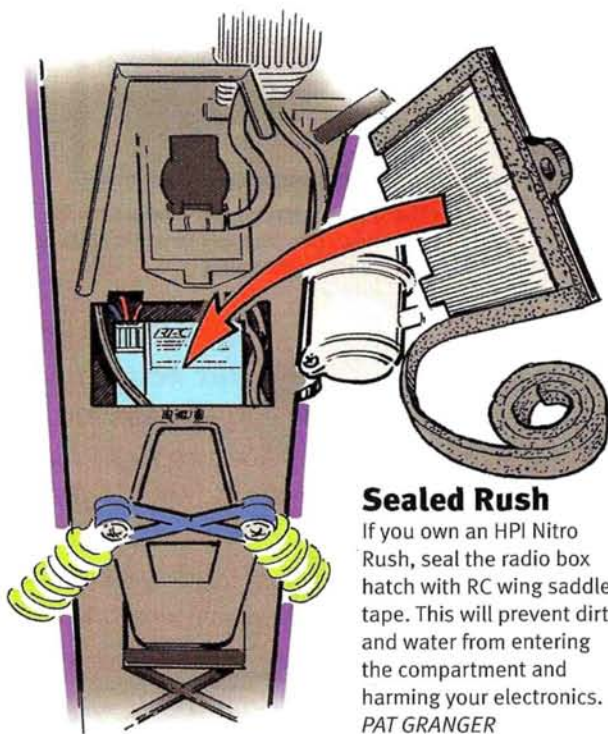
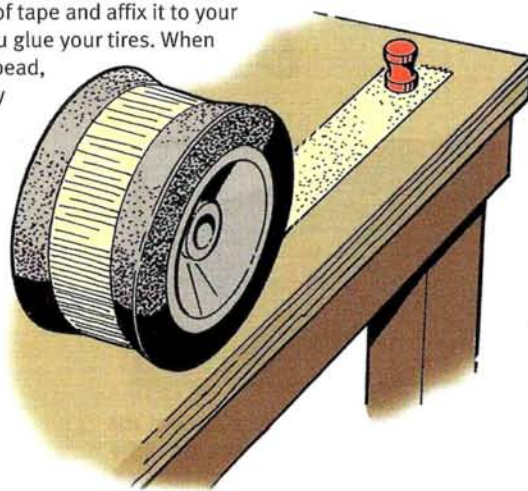
T. L. GORE
Tallahassee, FL



Easy Tire Gluing

Tear off a long strip of tape and affix it to your worktable before you glue your tires. When you have glued the bead, roll the tire up tightly in the tape to hold the rubber in place and provide a tight lock to the rim. Simply cut the tape away when the CA has cured.

DONALD MANNER
Carlsbad, CA



Sealed Rush

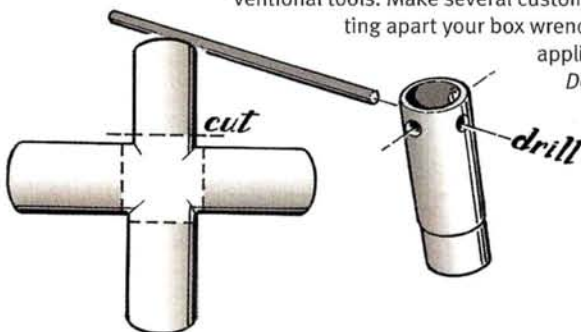
If you own an HPI Nitro Rush, seal the radio box hatch with RC wing saddle tape. This will prevent dirt and water from entering the compartment and harming your electronics.

PAT GRANGER
Madison, WI

Custom Box Wrench

Sometimes it is difficult to get into tight places with conventional tools. Make several custom-size tools by cutting apart your box wrench to suit your application.

DOUGLAS
FOURNIER
Braintree, MA



Troubleshooting

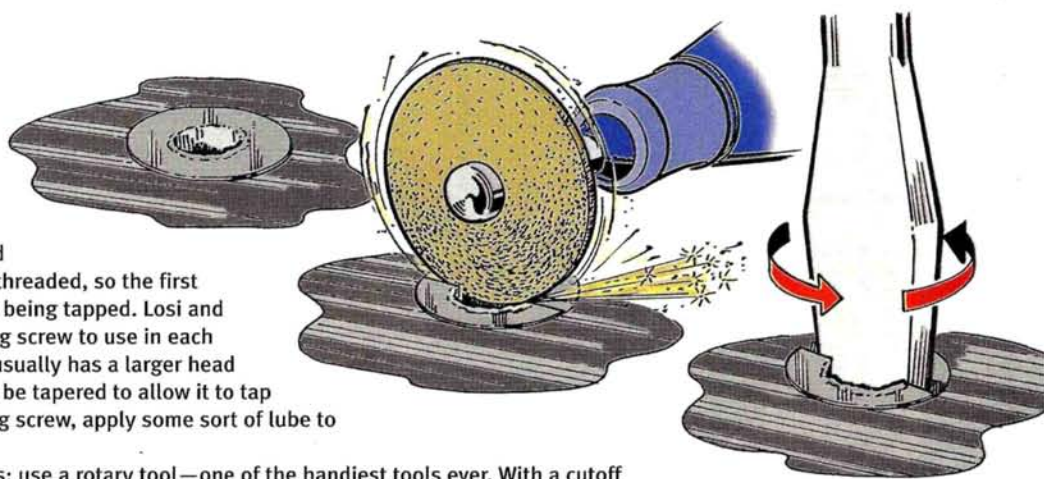
BY DEREK BUONO • ILLUSTRATIONS BY JIM NEWMAN

Stripped Screws

I have a Losi Double XT, and the screws on the bottom of the chassis are stuck. My Allen wrench just spins in the holes. How can I get the screws out? [email] JUSTIN CLAY

Today's composite plastics are very hard and rarely come from the factory with the holes threaded, so the first time a screw is inserted, the hole is actually being tapped. Losi and many other companies now include a tapping screw to use in each hole before you assemble a car. This screw usually has a larger head to prevent it from stripping, and it may even be tapered to allow it to tap the hole more easily. When using the tapping screw, apply some sort of lube to reduce friction and make the job easier.

Now let's get the screws out of the chassis: use a rotary tool—one of the handiest tools ever. With a cutoff wheel, slot the screw's head. You may hit the chassis, but if you take your time, you should be able to minimize the damage. You could use a square file instead of a rotary tool, but it may damage the chassis more. With a flat-head screwdriver, you should now be able to remove the stripped screws. Be sure to use a top-quality screwdriver when you install the new screws. It may cost a little more but will definitely be worth it. Trinity, RPM and Hudy all make excellent screwdrivers.



New Traxxas Aluminum Shock Components Work With Your Stock Parts!

T-Maxx Blue Shock Bodies

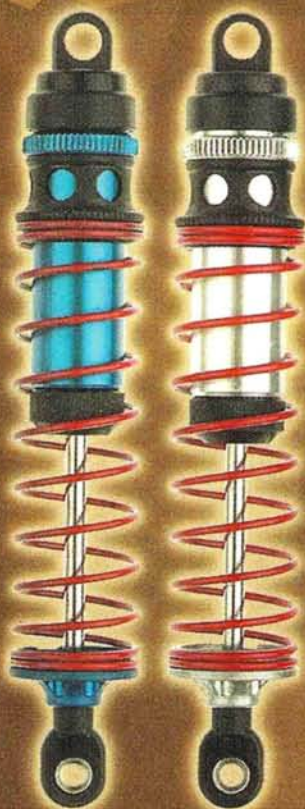


CNC machined, blue anodized aluminum shock bodies, sold in pairs. RRP \$511

Blue Lower Spring Retainers



Machined, blue anodized aluminum retainers, sold in pairs. RRP \$516



Aluminum Upper Spring Retainers



Machined upper spring retainers, sold in sets of 4. RRP \$530 8mm, RRP \$520 4mm

T-Maxx Silver Shock Bodies



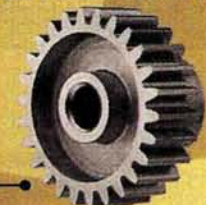
CNC machined, natural silver aluminum shock bodies, sold in pairs. RRP \$510

Silver Lower Spring Retainers



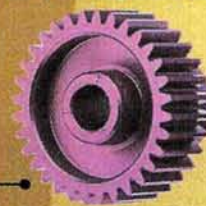
Machined, natural silver aluminum retainers, sold in pairs. RRP \$515

48P Absolute Series Pinions



Super hard, lightened, and cut with unmatched precision. Great with any spur, but with an Absolute spur, even on-off noise is gone! Available in 48P in 16T thru 28T sizes. RRP \$415 - RRP \$475

48P / 64P SuperLite Aluminum Pinions



They're lightened, hard anodized and precision cut. Available in 48P in 16T thru 28T, and 64P in 24T thru 38T. RRP \$30XX (48P) and RRP \$1XX (64P). Only \$4.25

48P Hard Nickel Plated Steel Pinions



These precision cut gears have an extremely hard coating that makes them really last. Available in 12T thru 36T. RRP \$0.12 - RRP \$0.35

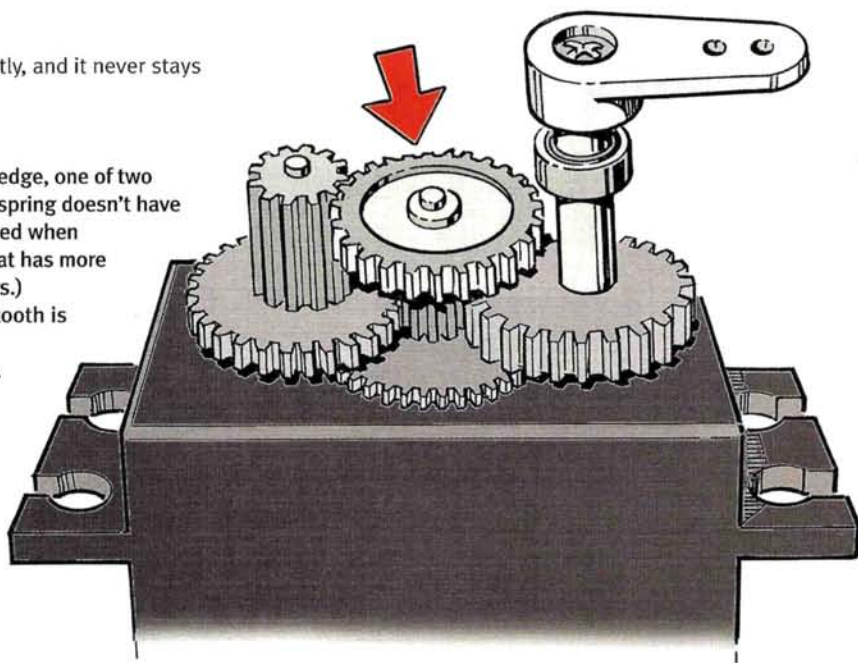
Servo won't stay Centered

Lately, my truck has been acting funny. I center the servo constantly, and it never stays put. What's happening? [email]

GREG RUSSELL

Assuming that the trim knob isn't being moved without your knowledge, one of two things may be happening: the servo-saver may be too soft, i.e., its spring doesn't have enough tension to center the servo. This problem can be exaggerated when under load. The simple fix is to replace the servo-saver with one that has more tension. (GS Racing and Kimbrough make replacement servo-savers.)

The more likely cause is a chipped servo tooth—or teeth. If a tooth is chipped, the servo may lose its center position whenever it's turned. You may hear a slight clicking when you turn the wheels. Take the servo out and check the gears. Refer to the manual's diagram of the gear layout, or take the gears out carefully and set them down in the order in which they came out to avoid later confusion. Clean all the gears and replace the ones that are chipped or worn. It is a good idea to change all the gears at once; although they might not all look worn, they could fail in the future. Reassemble the servo and put it back in the truck, and your problem should be solved.



1999 World Cup and National Champion

"I only care about performance, and that's why I run Robinson Racing gears and slipper clutches exclusively."

— Richard Saxten

www.robinsonracing.com

Rustler/Stampede/Bandit/Sport Nitro/Electric Sun Gears



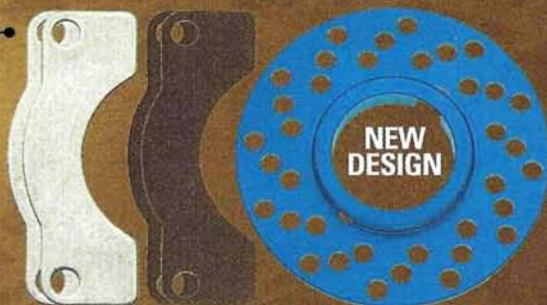
CNC Machined from bar stock, these hardened, Sun Gears will last longer in your Traxxas machine. RRP 8500

T-Maxx Vented Flywheels



Aluminum-vented flywheels move air over clutch bell, improving performance and cooling. RRP 8551 Blue, RRP 8550 Natural Silver

NEW T-Maxx Aluminum High Performance Brake Kit



New, lightweight aluminum high performance brake kit. Includes bigger, more aggressive brake pads and steel backing plates. One piece vented rotor minimizes side-to-side wobble. RRP 8560

Hardened Steel Spur Gear With Ball Bearing



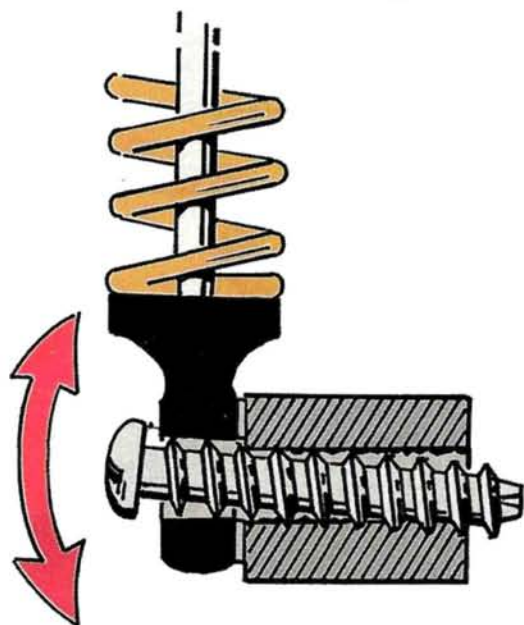
Precision CNC machined from solid steel, and then hardened, these spurs will last and last. RRP 8572 T-Maxx and Nitro Rustler, RRP 8565 Nitro Stampede



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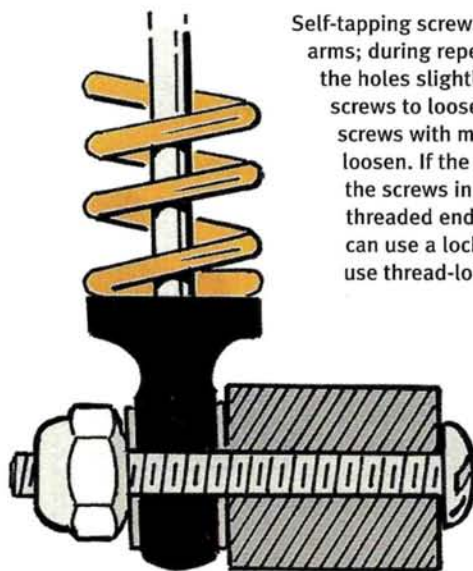
Troubleshooting



Self-Loosening Screws

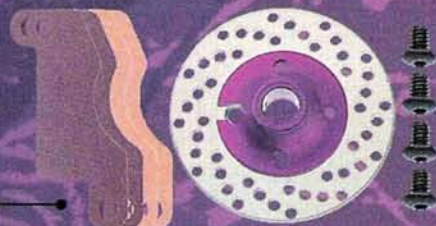
The rear shocks on my car keep coming unscrewed from the suspension arms. Why does this happen? [email]

CLARK MICHAELS



Self-tapping screws hold the shocks on the rear suspension arms; during repeated removal and reinstallation, they enlarge the holes slightly. Constant engine vibration then causes the screws to loosen. To fix this, you can replace the self-tapping screws with machine screws, which have less tendency to loosen. If the arms are too worn to hold the screws, thread the screws in through the rear of the arms and let the threaded end stick out the other side. With this setup, you can use a locknut to hold the shock on the screw. Be sure to use thread-lock to prevent the locknut from vibrating off.

RS4 Nitro Aluminum Brake Kit



Lightweight aluminum, variable braking system. RRP 1575

RS4 Nitro Vented Flywheel



Aluminum vented flywheels move air over clutch bell, improving performance and cooling. RRP 1570
RRP 1571 Pull Start

Stealth Sedan Spurs



These precision machined spur gears are super quiet. They're available in 48P in 60T thru 96T sizes, and fit any HPI electric car or truck. RRP 1860 thru RRP 1896.

RS4 Nitro Small Aluminum Drive Pulleys



Hardened drive pulleys, sold in pairs. RRP 1538

RS4 Top Shaft Pulley



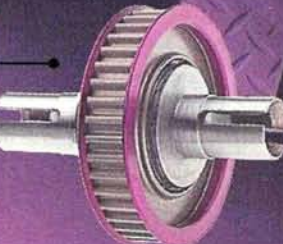
One piece pulley and shaft are precision cut and hard anodized. Purple anodized side flanges are pressed on. RRP 1527

RS4 / Pro / Pro2 / Nitro Aluminum Outdrives



40% lighter than stock ball diff outdrives. RRP 1585

RS4 Complete Ball Diff Units



Hardened steel outdrives, ground and polished thrust washers, 2 5x8mm ball bearings, and aluminum pulley. RRP 1590 Electric
RRP 1595 Nitro

RS4 Diff Pulleys



Precision machined, hard anodized aluminum diff pulleys. RRP 1539 nitro sedans
RRP 1528 electric sedans

RS4 Nitro Lightened Gear Adapter



This lightened gear adapter includes a machined nylon spur that's tougher than the stock gear and will last longer. RRP 1535

www.robinsonracing.com

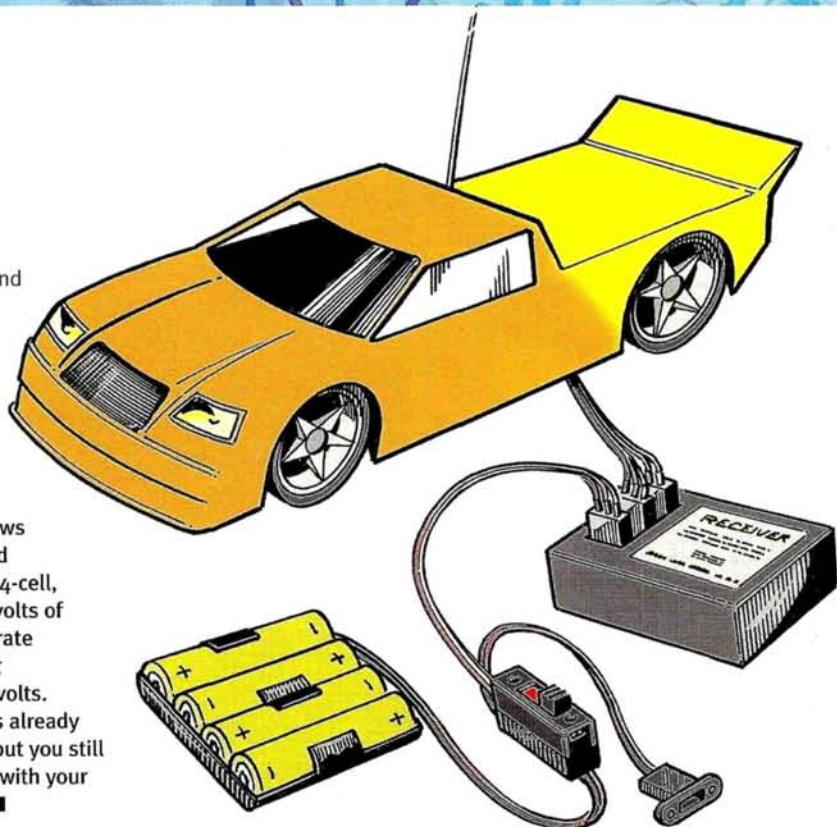
RS4 Nitro 32 Pitch Conversion Kit is available. RRP 1536

Yes, you do need a Battery

I'm still fairly new at RC cars, but I bought an HPI Super Nitro RS4 and a radio. I've just about finished building the car, but I can't get the servos to work. I have a JR Racing Python 2-channel radio. Apparently, the model has BEC circuitry that eliminates the need for batteries on board the car. I don't have a battery pack installed in the car, and it wasn't included with the radio. What's wrong? [email]

JUSTIN MITCHELL

In an electric-powered vehicle, a battery eliminator circuit (BEC) allows a receiver to operate off the main battery pack in an electric-powered vehicle. Many years ago, the onboard radio gear needed a separate 4-cell, 6V battery because the receiver could not handle the full 7.2 to 8.4 volts of a 6- or 7-cell battery pack. The BEC eliminates the need for a separate receiver battery (hence the "battery eliminator" name) by "stepping down" the voltage of the 7.2 or 8.4V battery to a receiver-friendly 6 volts. On a nitro car, the BEC is redundant because receiver-pack voltage is already as low as or lower than the voltage the BEC is designed to provide, but you still need a receiver pack! Use alkaline batteries in the holder that came with your Python, or buy a rechargeable receiver pack from the hobby shop. ■



RC10-GT Steel Combo



Precision machined from solid steel, then hardened, this 65T spur and 15T bell combo will last and last. The extra-hardened clutch bell fits ALL Associated and MIP shoes. RRP 2365

www.robinsonracing.com

Hardened Steel Idler Gear



Cut from solid steel stock, this gear is lightened and hardened for super quiet precision and extra long life. Jammin' tranny grease is included. RRP 2213 RC10-GT, RRP 7505 Ultima GP-R

Associated Titanium Stealth Top Shaft



CNC Machined from solid titanium, this super hard, super light top shaft will fit any Stealth transmission. RRP 1512.

Hardened Diff Gear



Hard anodized, precision CNC machined aluminum diff gear. RRP 1513 RC10-GT RRP 7500 Ultima GP/EP-R

Blue Lightened Slipper Kit



The rear plate is hard anodized and the front plate is color treated. The front plate holds the pad forcing it to slip on the rear plate. When pad wears, just flip it over for a new surface. RRP 1515 Associated, RRP 7515 Kyosho Ultima

Aluminum Outdrives



40% lighter than stock ball diff outdrives. RRP 1475 TC3, RRP 1502 B3/T3

TC3 Ultra 48 Pitch Spurs



Precision machined from heat-resistant plastic, these spurs mesh flawlessly with our pinions. Available in even numbers from 70T thru 80T, RRP 1670 RRP 1680.



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Kyosho Inferno TR 15

Big-buggy tech in a smaller package by Peter Vieira



Everybody wants an 1/8-scale, nitro-powered buggy. Even the most casual hobbyist knows that the big buggies mean business. Unfortunately, the whine of a free-breathing .21 engine and the space required to open one up can limit the real estate available for full-on 1/8-scale off-road action. Cost is a factor, too; no 1/8-scale buggy is what you would call cheap. Kyosho hopes to make the 1/8-scale thrill factor accessible to more people by shrinking big-buggy tech down to 1/10 scale with the Inferno TR 15. The baby Inferno gets its name from the five-time IFMAR World Champion Inferno series, so Kyosho definitely has cred here. Let's see if the little buggy makes big fun.



DATA CENTER

VEHICLE TYPE 4WD, .15-powered off-road buggy

BEST BUYER RC enthusiasts looking for 1/8-scale-style action on a low budget, all fun-oriented nitro fans

KIT RATINGS (poor, satisfactory, good, very good, excellent)

Instructions Very good

Parts fit/finish Very good

Durability Very good

Overall performance Very good

SPECIFICATIONS

MODEL Inferno TR 15

MANUFACTURER Kyosho

DISTRIBUTED BY Great Planes

SCALE 1/10

STREET PRICE \$269.99

DIMENSIONS

Wheelbase 10.8 in. (275mm)

Width 9.5 in (241mm)

WEIGHT

Total, as tested 62.4 oz. (1,768g)

CHASSIS

Type Plate

Material 2mm stamped aluminum

DRIVE TRAIN

Type Shaft-driven 4WD

Transmission ratio 3.36:1

Clutch-bell/spur-gear ratio 15/39

Drive shafts Dogbones

Differentials Bevel gear

Bearing type Metal bushing

SUSPENSION

Type F/R Upper and lower wishbone/lower wishbone and camber link

Shocks Plastic-body, fluid-damped

WHEELS

Type One-piece plastic 2.2-in.

TIRES

Type Kyosho H-pin

ENGINE AND ACCESSORIES

Engine Kyosho GS15R

Carburetor Rotary, single-needle

Clutch 2-shoe centrifugal

Exhaust system Cast manifold and pipe

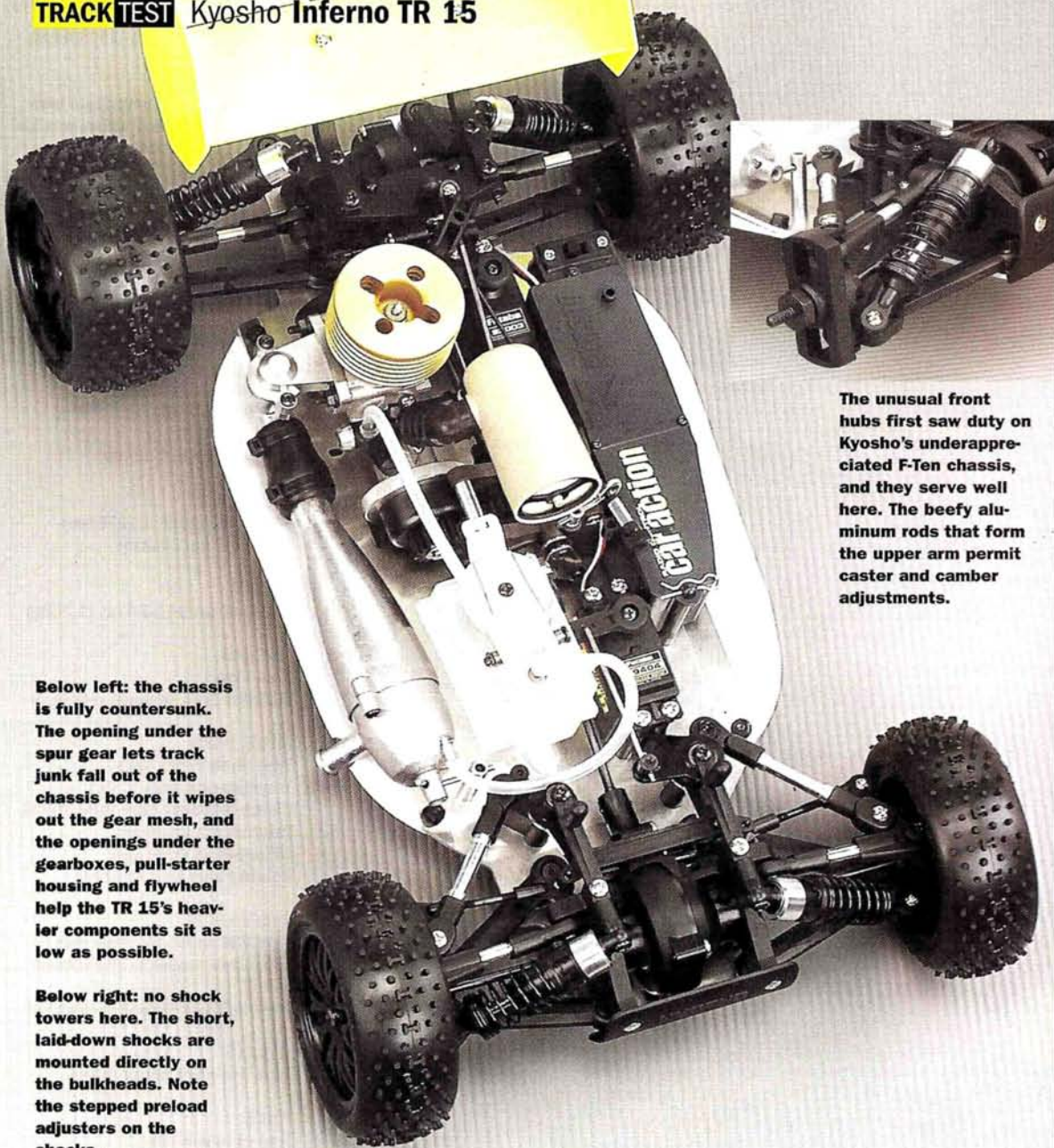
Fuel tank capacity 75cc

LIKES

- Most of the fun of an 1/8-scale buggy with less noise, cost and hassle.
- Reliable, easy-to-start engine.
- Enclosed radio box protects receiver.

DISLIKES

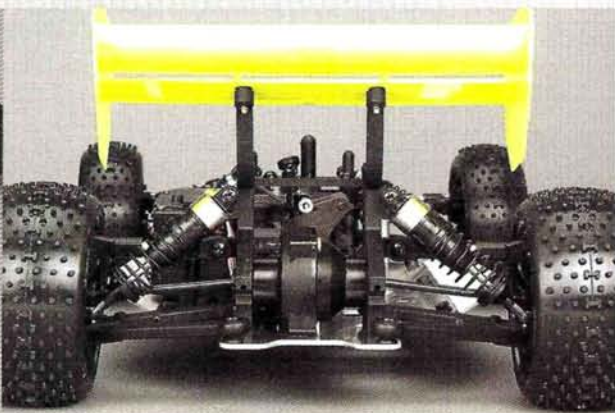
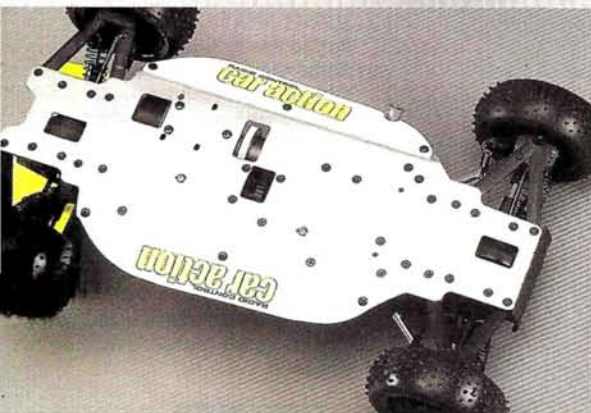
- Weak servo-saver numbs steering response.
- Doesn't handle rough terrain well.
- No ball bearings or low-end carburetor adjustment.



Below left: the chassis is fully countersunk. The opening under the spur gear lets track junk fall out of the chassis before it wipes out the gear mesh, and the openings under the gearboxes, pull-starter housing and flywheel help the TR 15's heavier components sit as low as possible.

Below right: no shock towers here. The short, laid-down shocks are mounted directly on the bulkheads. Note the stepped preload adjusters on the shocks.

The unusual front hubs first saw duty on Kyosho's underappreciated F-Ten chassis, and they serve well here. The beefy aluminum rods that form the upper arm permit caster and camber adjustments.



YOU'LL NEED ■ Fuel ■ 2-channel transmitter and receiver ■ Steering and throttle servos ■ Glow-starter ■ Receiver battery ■ Thread-locking compound ■ Polycarbonate-compatible paint

FACTORY OPTIONS ■ Engine mount—part no. FD-20. ■ Flywheel for O.S. engine—FD-49. ■ Heavy-duty differential ring gear—FZW-13. ■ Heavy-duty diff pinion gear—FZW-15. ■ High-strength diff case—FZW-25. ■ Turnbuckle steering rods—OTW-11. ■ Stainless-steel brake rotor—SPW-15. ■ Duralumin chassis—TRW-1. ■ Tuning spring set (5 pairs)—W-5013S. ■ Universal drive axles—W-5061. ■ Aluminum-body shocks—W-5153

building & setup tips

The Inferno TR 15 is an easy build that is speeded up by Kyosho's partial assembly. Right out of the box, the drive train is assembled and installed on the chassis, and the parts spin smoothly on metal bushings. If you prefer to install bearings you'll have to pull the drive train apart before continuing with the assembly. Thankfully, the instruction manual includes all the steps required to build the kit from the ground up. Here are some tips I found helpful as I built my baby Inferno:

Yes, I'm going to mention thread-lock. I know we tell you to use the stuff every time, but that just goes to show how important it is. In the case of the TR 15, you absolutely must apply medium-strength thread lock to the grub screws that hold the outdrives, engine, clutch, bell-crank and pivot-ball screws. If you don't, prepare to sift through the dirt to find the hardware that falls off your car during its first couple of runs.

Increase the brake-pad spacing. The brake pads seemed properly set for the rotor from the factory, but when dirt got into the works, the brake began to drag. I backed out the screws on which the pads float, and that allowed dirt to fall away from the rotor after braking. A half turn on each screw was all it took.

Don't scratch the shafts! The thick aluminum rods that form the front upper arms are the kit's prettiest pieces, and you'll be bummed if you hack them up by holding them with a pair of pliers as you thread the rods onto them. Since the rods aren't turnbuckles, you can easily thread the plastic parts onto them without touching the aluminum shafts with tools at all. Just thread the appropriate parts onto each rod by hand for the first couple of turns, then pass a wrench shaft through the molded parts to hold one end while you turn the other.

Jack up the servos. The included servo mounts hold the bottoms of the servos flat against the chassis, and that transmits chassis vibration directly to the servos. If the servos you choose to install touch the chassis, place a washer between the servo mounts and the chassis to gain a little extra clearance.

KIT FEATURES

• **Chassis.** Like so many other 1/10-scale nitro-powered cars, the TR 15 is built on a chassis constructed of stamped 2mm aluminum. In this case, the underside is countersunk for all fasteners except the engine-mounting screws and a pair of screws for the steering and throttle servos (each has one slotted hole to accommodate servos of different sizes, and the slotted holes take button-head screws). The chassis' radiused sides are much broader than those of most similar designs, and that helps maintain overall stiffness (despite an absence of significant upper bracing), and broad plastic mudguards are attached to the chassis' sides. The sides' radius is responsible for most of the chassis' stiffness, but there is some additional bracing up top: a steel rod links the rear bulkhead to the center spur-gear mount, and a pair of plastic straps bridge the steering bellcrank posts and front bulkheads. Still, it's easy to flex the front half of the chassis (as tested by the two-handed accordion-squeeze method). Whether that flex will show up to any ill effect on the track is another story.

• **Drive train.** Like the 1/8-scale Inferno that inspired it (not to mention every other 1/8-scale buggy I can think of), the TR 15 has full-time, shaft-driven 4WD. Unlike the big buggies, the TR 15 does not employ a center differential; instead, the 39T spur gear is keyed directly to a pair of outdrives to accept front and rear dogbone drive shafts that send their spin into sealed front and rear gearboxes. The gearboxes are identical and house matching gear differentials that are driven via a cast-in ring gear and cast bevel pinion gear. If the gearboxes look familiar, it's because you've seen them on the Kyosho's QRC reverse-transmission nitro cars and the current SuperTen chassis. The parts are put to good use here and have the welcome feature of access holes for the diff outdrives' critical grub screws.

Dogbones get power from the diffs to the wheels at both ends of the car, and everything works smoothly. I was disappointed to find that the TR 15 uses metal bushings on all the rotating parts. At the very least, I'd prefer ball bearings on the diff outdrives, pinions and spur gear especially since Kyosho



Above: the closely fitting front and rear gearboxes house ring and pinion gears. The diffs and pinions spin on metal bushings, and all the parts seen here (minus the bushings) come from the SuperTen/QRC parts bin.

Right: the plastic shocks are quick and easy to build, thanks to factory-installed seals and one-piece piston/shock shafts.

assembles the TR 15's drive train for you, so you have to disassemble it if you wish to install bearings.

Since there isn't a center diff, the dual-disc brakes of a three-diff car are not required, and the TR 15 uses a single disc instead. The rotor is molded of high-fiber plastic, and the caliper is a pair of plain steel pads. It's a basic setup that should work well enough.



More SuperTen/QRC parts in action. Since there's no center diff, a single disc brake is all the TR 15 needs for four-wheel braking.

The final drive-system components are the friction-fit drive hexes, which seem to be made of a harder alloy than the hexes of the other Kyosho vehicles that use the system. I hope they stay put instead of being pulled off with the wheels, as friction-fit hexes sometimes do.

• **Suspension/steering.** The TR 15 takes an unusual technological turn in the suspension department. Both ends are equipped with unbraced lower arms that are attached to the chassis by 6mm pivot balls—one for each "leg" of each suspension arm (just look at the pictures, if the anatomy analogy is making your head throb). Screw pins pass through the outboard ends of the rear arms to capture the rear hubs in the usual way, but the front suspension makes use of pivot balls for the steering hubs, so there's no need for hub carriers, but you do need a triangulated upper arm, since there is no hinge pin to hold a hub carrier perpendicular to the suspension arm. Although molded arms would suffice, Kyosho's solution is an assembly of robust aluminum rods and molded eyelets that make a pleasingly high-tech-looking front end. And if you're in the mood for wrenching, the setup permits caster and camber adjustments. Similarly robust (but otherwise entirely conventional) aluminum camber links



KO Propo EX-1 Mars transmitter and receiver

I've used this compact, orange-handle radio in too many vehicles to list, and it remains one of my favorites thanks to its traditional wheel and trigger locations, solid feel and numerous other features. My favorite feature is the System Level function that enables me to skip the higher-level functions that I don't use often and stick with the "meat-and-potatoes" stuff—subtrims, expo, end-points and dual rates. If I ever need to reactivate servo speed settings, multi-position throttle, third-channel options, etc., they're just a button click away.

Futaba S9404 and S3003 throttle servos

I used a coreless, high-speed Futaba servo to steer the TR 15, but a standard servo would work well enough for play. I wanted to see what the buggy would be able to do with a little more muscle and speed behind the bellcranks, and the S9404 was a good fit with about 80 oz-in. of torque and a claimed transit time of 0.11 second. On the brake side, a Futaba S3003 standard servo had no trouble pulling the reins of the TR 15, and it provided more torque than the light-action Kyosho carburetor would ever need to open and close.

Trinity Nitro Metal Hydride receiver pack

The long run times of nitro vehicles make for a lot of fun, but it's all too easy to forget about the condition of your receiver pack. One minute you're in full control, and the next, the steering gets slow and BWAAAAHHHHH. the car takes off for the woods. I set up my TR 15 with an 1100mAh receiver pack to avoid that kind of trouble, and I chose Trinity's 3x2 model for a perfect fit in the TR 15's molded battery box.

DuraTrax Red Alert 20-percent nitro fuel

Instead of a full gallon, I grabbed a quart bottle of the red stuff to keep a little extra cash in my pocket for the post-test pizza run, and I had good results (with the fuel and the pizza). According to DuraTrax, Red Alert contains "top-quality synthetic and castor oil 14-percent blend for superior performance," but all I know is that the engine started easily and ran reliably. That's what I look for in a fuel.

Add foam tire inserts. Kyosho doesn't include foam inserts with the TR 15, but any foam inserts from a set of 2.2-inch buggy tires will work. You'll have to trim the fronts to fit the narrower front rims. If you're really cheap, you can make your

own strip-type inserts from scraps of upholstery foam snagged from an upholstery shop.

Tighten those wheels! The friction-fit drive hexes require a good, hard crank

on the axle nuts if they're to stay put—and even then, it's wise to cinch them up every run. Be especially wary of the right rear wheel; I spun it off the car twice.

hold the rear hub carriers in check. For you Kyosho completists out there, the front and rear hubs also appear on Kyosho's F-Ten chassis.

Of course, all the aforementioned suspension stuff is useless without a set of shocks. The plastic-body "sport" shocks include factory-installed seals and polished aluminum caps with molded eyelets. Unusual but welcome features are the stepped preload adjusters, which allow one of six settings to be selected without tools or additional parts. The shock's pistons are also unusual in that they are metal, permanently attached to the shock shafts and have flats cut in the piston disc instead of holes. The front and rear shocks are identical, wear matching springs, but seem short for off-road duty even when fully extended. But thanks to the shocks' deeply laid-down position—so low that the shocks don't even require shock towers and instead bolt directly to the front bulkheads—the TR 15 still has adequate suspension travel.

The TR 15 is pointed in the right direction by a pair of bellcranks that are joined to the steering hubs with threaded rods. A nonadjustable servo-saver is built into the left bellcrank, and its plastic spring is very soft; if you still manage to break a servo with *this* servo-saver, you must be some kind of super-hack. A wire linkage joins the bellcranks to the steering servo and is attached to the servo with a Z-bend. It works, but watch for slop in the servo arm.



The GS15R engine looks like an average engine on the outside, but the nicely sculpted, bushed connecting rod was a pleasant surprise. I was less happy with the pull-starter reel and shroud, which simply snaps over the backplate and is secured by a single screw, but the parts stayed together just fine.

The cast exhaust system looks as if it belongs under a kitchen sink, but it performs much better than an airplane-style muffler. Note the deep convergence cone and O-ring seal.

• **Engine and accessories.** As you may have guessed from the "TR 15" designation, the little Inferno is powered by a Kyosho .15 engine—a GS15R, to be exact. It has a pull-starter, single-needle rotary carburetor, machined heat-sink head, snorkel-type air filter, dual crank bearings, machined connecting rod and nickel-plated sleeve. The 15T metal clutch bell spins on a plastic-caged roller bearing and hides a 2-shoe clutch mechanism. Like other Kyosho engines, the GS15R is bolted directly onto the chassis without engine mounts; the screws are tapped into the crankcase. A tuned-style pipe is also part of the package. It's a cast affair that's clamped together with a pair of screws and features a deep convergence cone. The manifold is also a multi-piece casting and is joined to the pipe with a molded coupler.

A primer-equipped, flip-top, 75cc fuel tank feeds the engine and is mounted directly on the chassis without O-rings or any other means of damping chassis vibration. Will it matter? We'll see at the track.

• **Body, wheels and tires.** The TR 15 wears a downsized body that looks a little cartoony compared with an 1/8-scale Inferno, but it's about as svelte as it can be and still cover the chassis fully. The Motion Graphics paint job makes the most of the body's chunky shape and, if nothing else, the TR 15 looks unique. Kyosho supplies a molded dual-plane wing with large side dams, and firm knobby tires cover the attractive mesh-pattern wheels. I like the black-on-black look of the wheels and tires, but I wish Kyosho included foam inserts for them. The round-carbass tires are easily deformed without inserts.

PERFORMANCE

After the usual break-in procedure, I opened up the TR 15 on pavement to see what it could do. The single-needle carb didn't allow fine-tuning for crisp, low-end throttle response, but once the GS15R engine was revved up, it ran strongly, with good mid- to high-rpm throttle feel. Satisfied with the carb settings, I moved to the dirt where the TR 15 is meant to play. The short, laydown shocks aren't well suited to truly rough ground, and the little Inferno was tossed around easily by backyard-type terrain (but to its credit, it never flipped). Smoother surfaces, such as fire roads, baseball diamonds, BMX tracks and (of course) RC tracks are where the TR 15 performs best and is the most fun—that's where I certainly had the best time. The Inferno doesn't feel as planted as a heavy, "full-size" 1/8-scale buggy, but otherwise it drives much the same. You can drift through corners wide open, or brake to square off your line and get back on the gas with all four tires hooked up. Jumping rollers was easy and fun thanks to the midair control offered by four powered wheels, and backside landings were as smooth as shock fluid spilled on Teflon. The TR 15 also proved to be a tough customer when I cased some jumps and landed the Inferno on its nose, tail, side and various combinations thereof. The only trouble I had with the car was a loose drive hex, which required a dab of thread-lock to stay put.

THE VERDICT

As a vehicle without a race class, the best way to measure the success of the Inferno TR 15 is to simply ask, "How much fun is this thing?" The answer: A lot.

Though not well suited to the anything-goes type of terrain most play vehicles are pounded on, the little Inferno is probably the most exciting 1/10-scale, off-road nitro vehicle for track-style surfaces. For

that type of play, I'd pick the TR 15 over a nitro truck or any other 2WD vehicle. I would make a few changes, though; I think a bearing set is a must, and foam inserts bring out the tires' best. But even completely stock, the TR 15 a successful fun-run entry that we hope will garner a following—and then we'll see if it's still a vehicle without a race class. ■

SOURCE GUIDE

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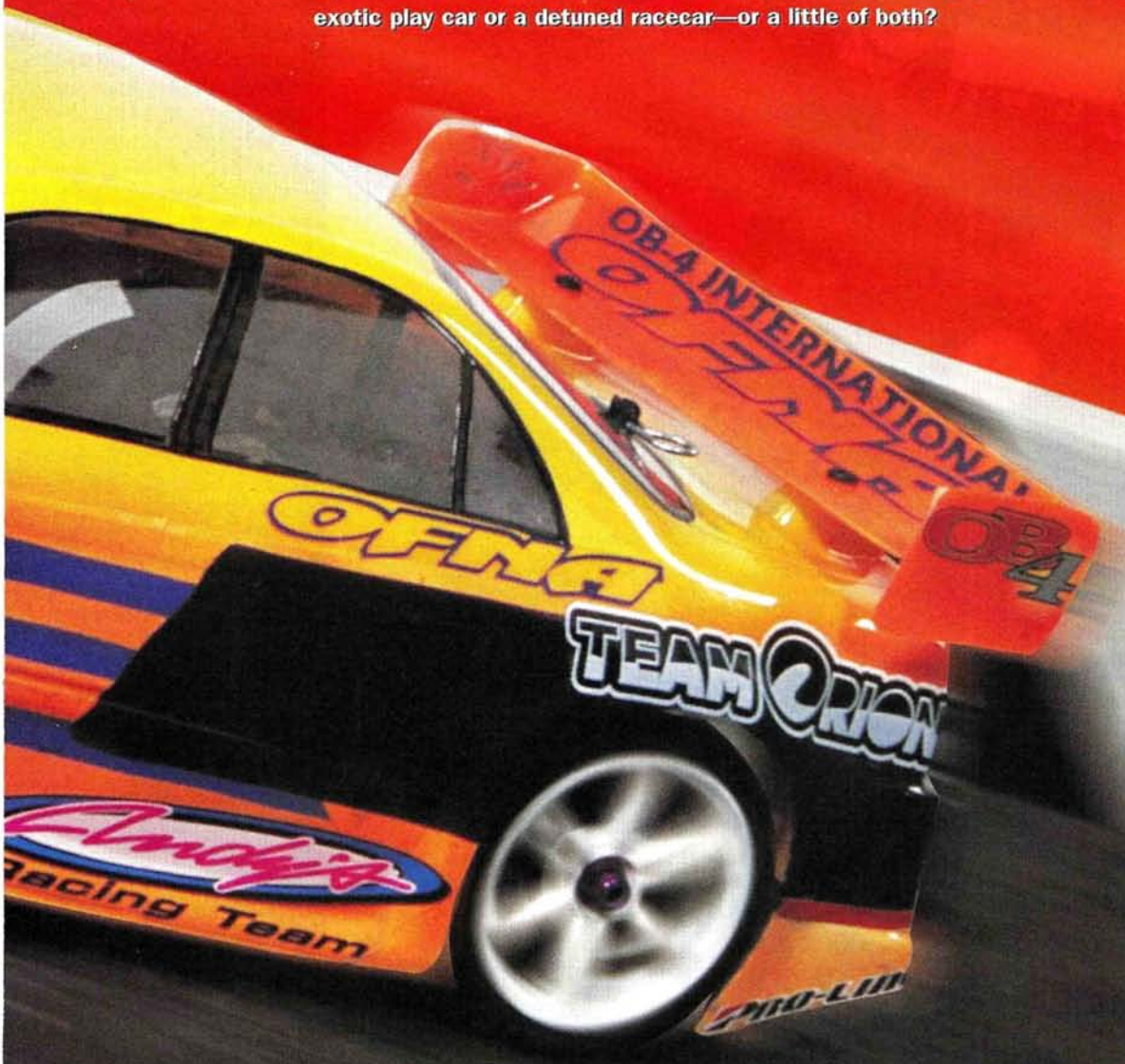
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OFNA OB-4 International RTR

Pro-level chassis in a ready-to-run package by Bob Hastings

Historically, ready-to-run vehicles have been aimed at new RC enthusiasts, and with an eye toward durability and affordability, most RTRs are made of relatively flexible materials and have few competition-oriented features. Such cars are fine for banging around the block, but not for racing. OFNA has taken a different route with its newest RTR, the OB-4 International. The International version combines a double-deck graphite chassis with plenty of anodized-aluminum parts, a full bearing set, 540 motor, reversing ESC, Airtronics radio and an Andy's body. Does the unusual combination of entry-level electronics and pro-style chassis make the OB-4 International an exotic play car or a detuned racecar—or a little of both?



DATA CENTER

VEHICLE TYPE 1/10-scale, RTR electric, 4WD touring sedan

BEST BUYER RC enthusiasts of any level looking for a factory-built, competition-capable sedan

KIT RATINGS (poor, satisfactory, good, very good, excellent)

Instructions Good

Parts fit/finish Very good

Durability Very good

Overall performance Very good

SPECIFICATIONS

SCALE 1/10

LIST PRICE \$539.95

DIMENSIONS

Wheelbase 10.08 in. (256mm)

Width 7.45 in. (189mm)

WEIGHT

Total, as tested 52.17 oz. (1,479g)

CHASSIS

Type Double-deck

Material Woven graphite

DRIVE TRAIN

Type Dual-belt 4WD

Transmission Pinion/spur

Drive shafts CV-style axle

Differentials (F/R) Ball w/Delrin outdrives

Bearing type Metal-shielded ball bearings

SUSPENSION (F/R)

Type Upper and lower A-arm/lower A-arm and upper link

Damping Oil-filled, coil-over shocks

WHEELS

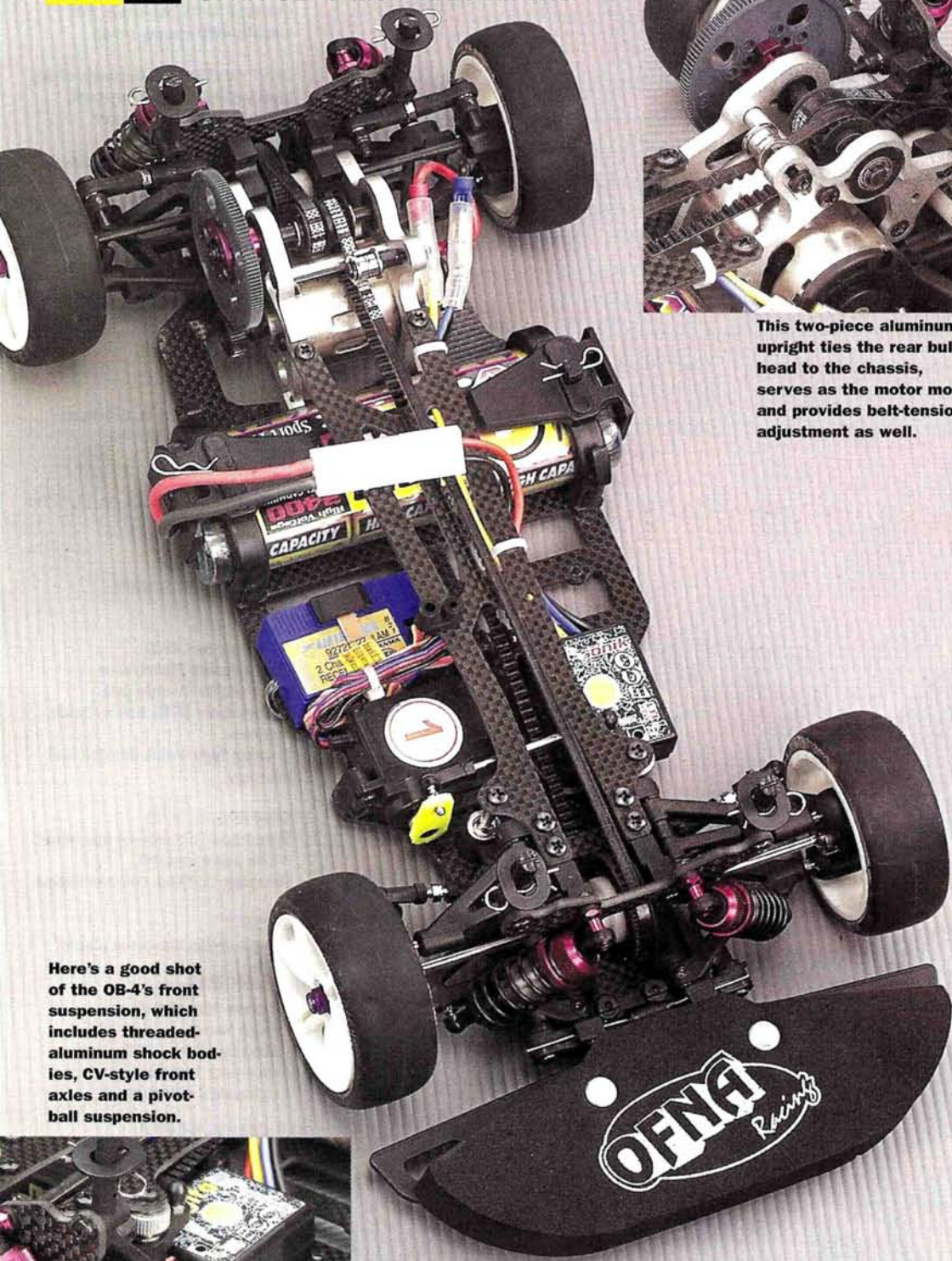
Type 9-spoke, one-piece plastic

LIKES

- Carbon-fiber chassis and shock towers.
- Accommodates saddle- and stick-pack batteries.
- Lightweight outdrives.

DISLIKES

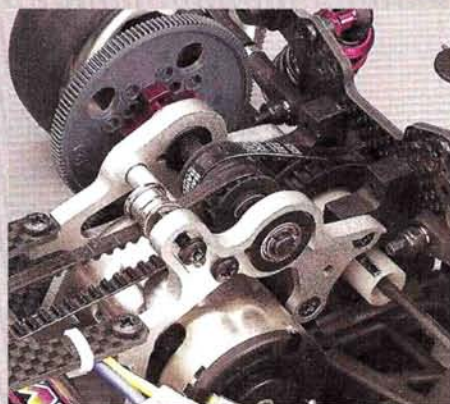
- No reverse lock-out.
- Supplied motor is underpowered for a car of the OB-4's capabilities.



Here's a good shot of the OB-4's front suspension, which includes threaded-aluminum shock bodies, CV-style front axles and a pivot-ball suspension.



No expense was spared in the graphite department; even the steering plate is carbon fiber.



This two-piece aluminum upright ties the rear bulk-head to the chassis, serves as the motor mount and provides belt-tension adjustment as well.

building & setup tips

OFNA's new display box will definitely impress the casual passerby at the hobby shop; even a peek at the chassis inside the box confirms that a lot of planning and care went into creating this touring car. This RTR looked fine, but you should still check a few items before you strap in your first battery.

Screw check. Grab your Phillips-head screwdriver and quickly tighten all the fasteners on the upper and lower deck; flip the chassis over and do the same on the other side. A few minutes here may save you a lot of bench time later.

Gear mesh. The pinion and spur should have just a "tick" of free play—too tight, and the drive train will bind; too loose, and you risk stripping the gears.

Body posts. Mount the posts on the chassis as instructed, and then mark the body-post locations before you paint the body.

Speed control. The OB-4's electronic speed control features forward and brake/reverse, but there's no reverse lock-out. This is only an issue if you plan to compete because reverse is not allowed in most events. Just remember not to back out of trouble during a race; wait for the marshal to assist your car.

SETUP

The instructions include a detailed guide for setting the front and rear camber angles, track width, shock angle, down-stop and toe. There's also a blank setup sheet to help track any subsequently needed handling tweaks. I tested the OB-4 using the factory recommendations; the car is softer in the rear, and that creates a slight push. New racers will appreciate not ending up backward in the boards on their first time out on the track.

YOU'LL NEED ■ 6-cell battery pack ■ Eight AA batteries ■ Charger ■ Polycarbonate-compatible paint

FACTORY OPTIONS ■ Aluminum arm blocks (F/R)—part no. 39471/39472 ■ Aluminum front stabilizer mount—37951 ■ Aluminum servo posts (F/R)—37969/37970 ■ Aluminum servo-saver w/ball bearing—37953

INCLUDED TEST GEAR

Airtronics Blazer

The successor to the Rival, this 2-channel radio features a three-level LED battery meter, servo reversing and a charging jack. The Blazer's ergonomic shape and smooth control action feel very comfortable. The next Blazer Sport offers dual rates that would be better suited to the more performance-oriented OB-4.

Airtronics 94102 servo

This standard-type servo has a claimed 50 oz.-in. of torque, goes "lock-to-lock" in 0.22 second and has proven quite sturdy and reliable.

M Sonic ECO ESC

This 1.5x1.25x0.8-inch electronic speed control has simple push-button setup and a pair of LED indicators to tell when the limits have been set properly. I found that the ESC remained relatively cool during testing. Constant brake pressure engages reverse after a short delay. A reverse lock-out feature would have been welcome on this race-quality chassis.

ADDITIONAL TEST GEAR

not included

Orion V-Max 2400 Sport Pack

For longer duration without sacrificing the punch of Ni-Cd cells, this sport pack is a great compromise between traditional 2000 packs and 3000 NiMH batteries. The V-Max's 2400mAh cells are



matched with Orion's V-Max voltage-increasing process that is said to lower internal resistance and increase cell output for more power.

KIT FEATURES

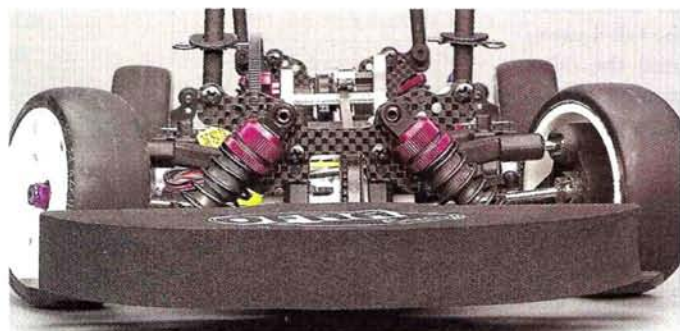
• **Chassis.** You'll see woven graphite everywhere you look on the OB-4—the upper and lower chassis, the shock towers and even the steering brace. This makes a stiff, light setup. The lower deck is equipped with a stick-pack holder, but the chassis is cut to accommodate saddle packs as well, and there are two hold-down straps for this optional setup. Using a saddle pack will require that you move the receiver from its stock location. A large cutout beneath the motor allows a lower CG, better cooling and easier access to the power-plant.



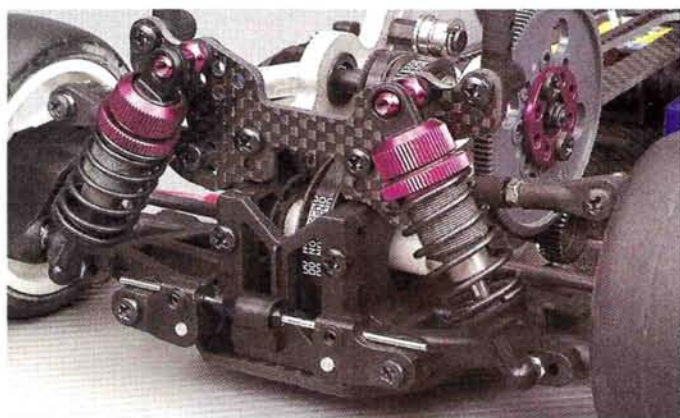
The chassis is slotted for saddle packs, and with four slots per side, you have space to move each pack fore and aft, or you can run a 4x2 pack configuration.

• **Drive train.** The RTR OB-4 relies on a proven twin-belt setup and includes an aluminum spur-gear

mount with aluminum "squeeze plate" outside the gear; a 35T pinion turns a 124T spur gear. Metal-shielded bearings between two CNC aluminum uprights support the spur's layshaft. These machined pieces hold the included 540 motor in place, serve as a belt-tensioner mount, and fit into the rear bulkheads for extra rigidity. Two belts lead from separate pulleys on the layshaft to a ball diff at both ends of the chassis. Each diff features 12 balls, and light, bearing-supported Delrin outdrives are keyed to the diff rings. While the



Above: the OB-4 RTR is functional and good-looking, too; the chassis features graphite shock towers with plenty of adjustment and a large foam bumper to absorb front impacts. Below: the OB-4 has ball-and-socket-type front and rear swaybars; note the number of upper and lower shock positions.



front end has CV-style axles, the rear wheels are driven by dog-bones.

• **Suspension and steering.** The OB-4's molded arms are sufficiently thick to prevent excessive flexing. The upper front arms ride on hinge pins, and plastic shims allow caster adjustment. The lower A-arms—also on hinge pins—are equipped with a ball-and-socket-style swaybar. Camber is adjusted with pivot balls. The rear suspension comprises a turnbuckle upper link and a pair of pivot balls off the lower H-arms to adjust camber and toe. Anodized-aluminum, threaded body, oil-filled coil-

overs support the car at all four corners. Purple shock caps and upper mounts add a racy touch to the already high-tech-looking chassis. The graphite shock towers have six upper mounting holes, and you have your choice of two lower positions in the front and three in the rear.

OFNA has installed Airtronics radio gear. A standard 94102 servo drives a bearing-supported 2-piece bellcrank with spring-loaded servo-saver; tension can be changed by turning a knurled adjustment wheel.

• **Body, wheels and tires.** Our test vehicle came with an Andy's Accord body, but the decal sheet was for a Dodge Stratus. I

THE COMPETITION

	Drive train	Speed control	Body	RTR w/radio	Shocks	Chassis	Street price	Reviewed
Associated TC3 Racer	Shaft	Not included	Yes	No	Plastic	Molded tub	\$225	2/00
HPI RS4 Pro 2	2-belt	Not included	No	No	Aluminum	Carbon-fiber double-deck	\$219	5/99
OFNA OB-4 RTR	2-belt	ESC	Yes	Yes	Aluminum	Carbon-fiber double deck	\$325	4/01
Tamiya TA04 Pro	2-belt	Not included	Yes	No	Plastic	Fiberglass double-deck	\$308	12/00
Yokomo MR-4 Pro	2-belt	Not included	No	No	Aluminum	Molded tub	\$229	4/00
Traxxas 4-TEC	2-belt	Mechanical	Yes	Yes	Plastic	Plastic double-deck	\$199	5/98

Cars are listed alphabetically by brand; OB-4 RTR comes assembled and includes radio and ESC. Price varies with location.

TRACKTEST OFNA OB-4 International RTR

didn't have an Andy's Accord decal sheet handy, so I substituted a set of Protoform stickers for the grill and headlights. The stock wheels were an immediate hit at the office. What initially appeared to be 6-spokes are actually tasteful 9-spokes equipped with a set of glued house-brand slicks.

PERFORMANCE

With a fresh Orion V-Max 2400 pack, I headed out to the track for some warm-up laps. Since the International is an RTR, I thought it only fair to test it exactly as it comes out of the box. The steering trim was just a little off (probably due to my playing with the transmitter before I ran the car), but otherwise the radio and ESC were set up properly and the car's camber and toe angles looked good. The OB-4 felt as locked-down and stable as a touring car can, and I was confident the car could handle more speed. Unfortunately, there wasn't any more on tap. The silver-can 540 motor just isn't a powerhouse, and although it's fine for first-timers, drivers of any experience will soon be looking for more speed, and the OB-4 can easily handle more power. I didn't have a mod motor handy, so I just ran off the 2400 pack with the stock powerplant. What the motor lacked in power it made up for with efficiency; I ran the car for a good 15 minutes before the pack dumped. In that time, I did all the stunts that a reversing ESC makes possible; 360 spinouts, reverse hot laps—the usual stuff. Belt cars don't usually like this kind of abuse, but the OB-4 never skipped a belt. For more race-like testing, I squirted the OB-4 around a tight course that made the most of the motor's torque and helped mask its speed deficiency. The car showed a mild ten-

dency to push, but a little bit of brake was all it took to lighten up the rear end. There's no reason the OB-4 International shouldn't handle competently in competition, and even if it does need a little tweaking for your track, its complete tuneability should make it easy to dial in.

THE VERDICT

As a driveway thrasher, the OB-4 International RTR is a blast, and it is up to more competitive driving when you feel the urge to race, but you will need to upgrade the electronics. First and foremost, you'll need a hotter motor. The ESC and servo can wait (don't hit reverse when you're racing!), but the included 540 motor will keep you out of the A-main no matter how well you drive.

In stock configuration, the OB-4 International is well equipped, handles predictably, and has all of the adjustability you could ever want. It just needs more power. ■

SOURCE GUIDE

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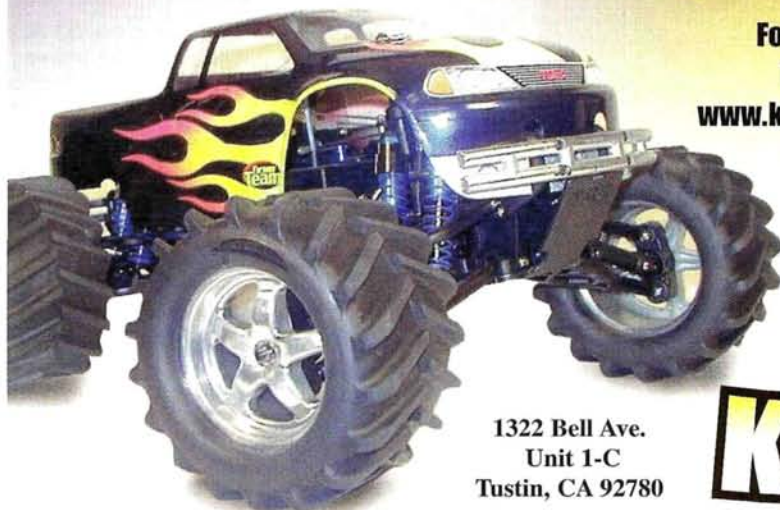
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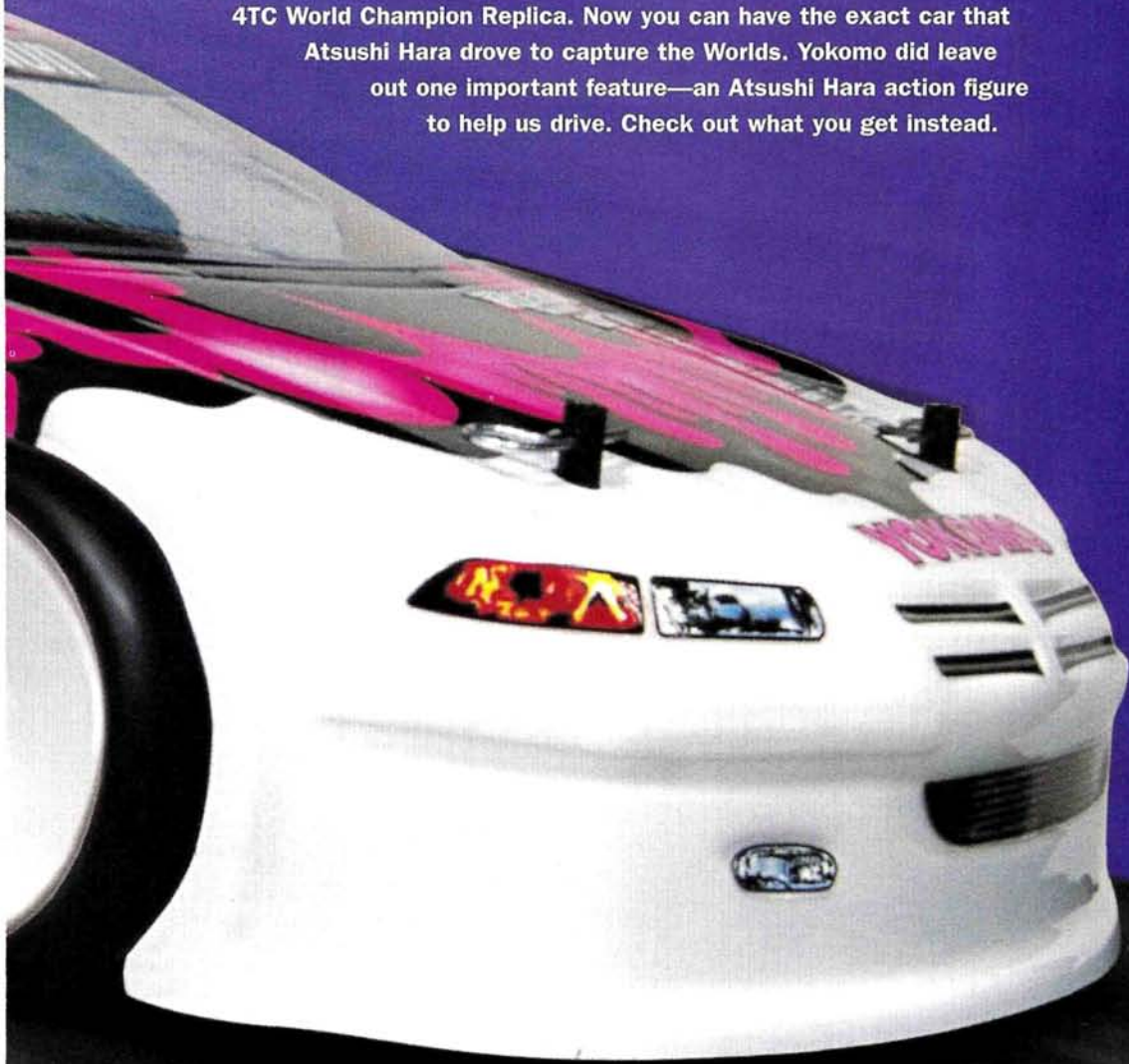
Kimbrough



Yokomo MR-4TC World Champion Replica

For sale: Hara's winning ride by Derek Buono

Ever dream of winning the Worlds? I know I still do. The people at Yokomo probably used to, but they are one up on you and me—they did it! Fortunately for us, they felt sorry for everyone who didn't win and have decided to help us out. For all those aspiring racers, Yokomo has released the MR-4TC World Champion Replica. Now you can have the exact car that Atsushi Hara drove to capture the Worlds. Yokomo did leave out one important feature—an Atsushi Hara action figure to help us drive. Check out what you get instead.



DATA CENTER

VEHICLE TYPE 1/10-scale electric
4WD touring sedan

BEST BUYER Anyone who wants a top-level tourer with all the bells and whistles in the box

KIT RATINGS (poor, satisfactory, good, very good, excellent)

Instructions Good

Parts fit/finish Very good

Durability Very good

Overall performance Very good

SPECIFICATIONS

MANUFACTURER Yokomo USA

MODEL MR-4TC World Champion Replica

SCALE 1/10

LIST PRICE \$475

ESTIMATED STREET PRICE
\$299.99

DIMENSIONS

Wheelbase 10.32 in. (258mm)

Width (F/R) 7.56 in. (189mm)

WEIGHT

Total, as tested 53.08 oz. (1,516g)

CHASSIS

Type Tub

Material Graphite-composite

DRIVE TRAIN

Type Dual-belt 4WD

Transmission Pinion/spur

Drive shafts (F/R) Universals

Differentials (F/R) One-way/ball

Bearing type 20 metal-shielded/
4 rubber-sealed

SUSPENSION

Type (F/R) Upper/lower wishbone

Damping Oil-filled, coil-over
aluminum shocks with threaded
bodies

WHEELS

Type Aero-dish (2 in.)

TIRES

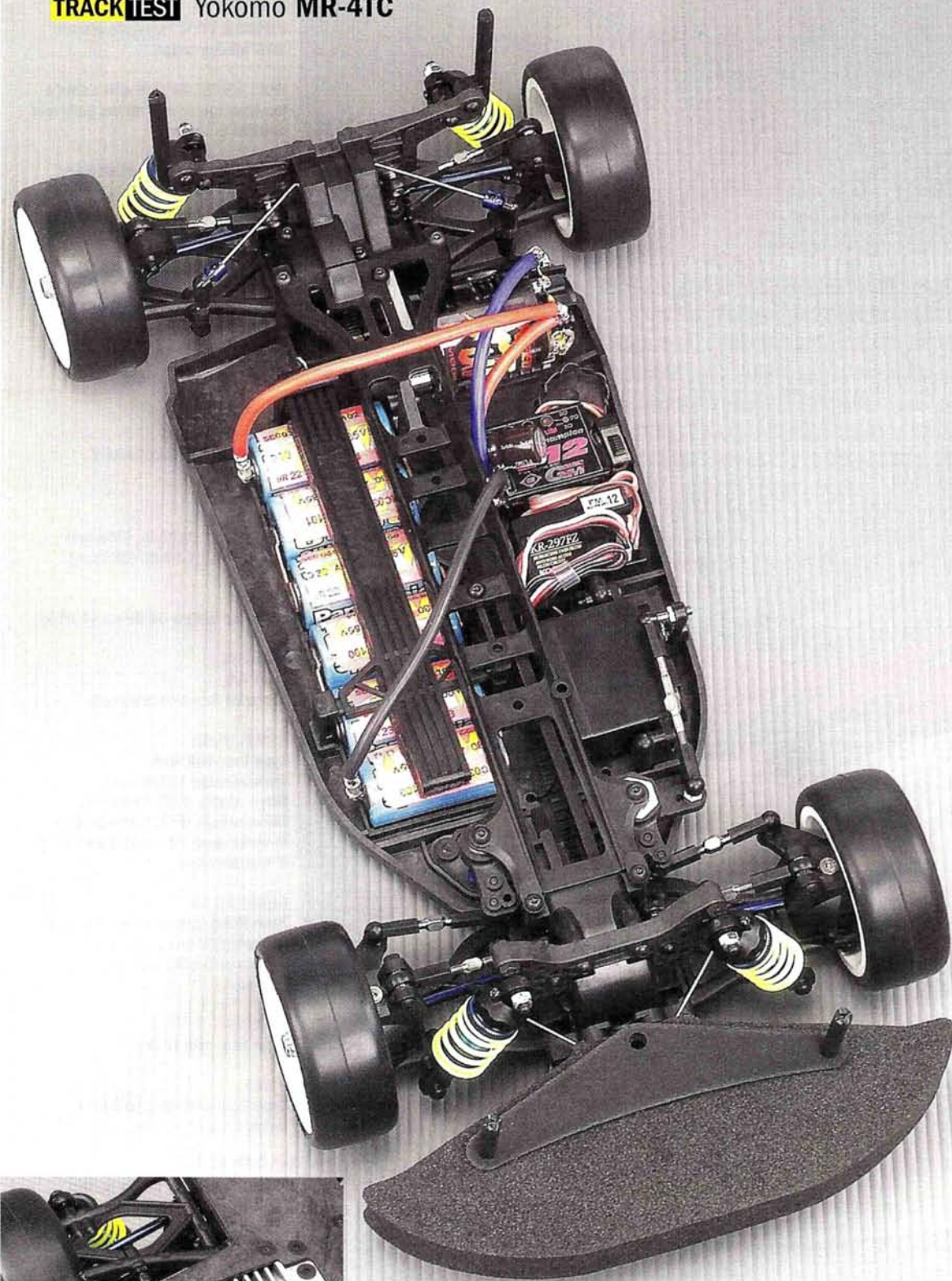
Type Belted 5G tires with firm,
molded inserts

LIKES

- Parts' finish was nearly perfect.
- Ball-bearing steering is included.
- Option-packed.
- Excellent track manners.

DISLIKES

- Doesn't include parts to make it full-time 4WD.
- No belt tensioner.



The cool heat sink sits in a cutout in the chassis. Not only does the aluminum draw heat away from the motor, but the air flow along the chassis' bottom also helps cool the motor.

YOU'LL NEED ■ 2-channel transmitter and receiver ■ Steering servo ■ ESC ■ Motor ■ 190mm body ■ 6-cell pack ■ Charger ■ Polycarbonate-compatible paint

FACTORY OPTIONS ■ Titanium-nitride-coated shock shafts (4 each)—part no. YS-53S-4T ■ Rear swaybar kit (3 bars)—ZS-412R ■ Steel front differential set—ZS-501S

building & setup tips

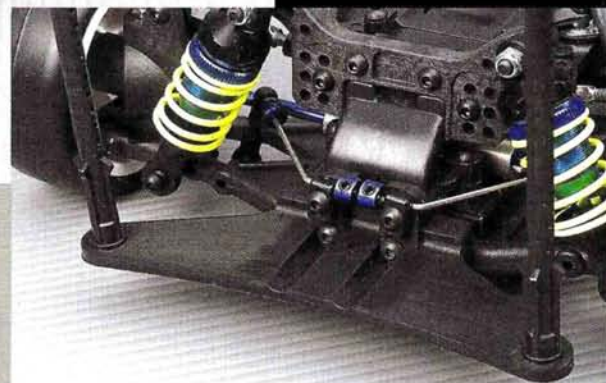
The instructions are very clear and do an excellent job of guiding you through the building process, except that the many changes in parts and setup from the original specs make for an abundance of addendum sheets. To make sure you follow the right setup, go through and mark the pages on which there are changes from the original. This will help you assemble the kit correctly. A few steps require special attention as you flip back from the main instructions to the addendum sheets.

BUILDING

The turnbuckles. A full set of titanium turnbuckles is included with the WCR. To make it easier to adjust them, install the turnbuckles so the threads are oriented in the same direction. In this case, I installed the turnbuckles so they can be turned toward the front of the car to increase camber and toward the rear to decrease it. There's nothing worse than twirling away at a turnbuckle only to discover you're turning it the wrong way. Installing all four turnbuckles so they're facing in the same direction helps avoid this.

Front suspension arms. Be sure to install the front arms correctly. Make sure that the arm cutouts are on the top side of the arms. You could install them upside-down if you're not careful.

Below: front and rear swaybars are included in the kit and are valuable tuning options. From this angle you can see the tuning options on the front shock tower. The two blue collars on the swaybar keep it centered and prevent the angled portion from rubbing on the bulkhead.



KIT FEATURES

• **Chassis.** The MR-4TC World Champion Replica (WCR) chassis is a molded tub design with Yokomo's stiffer graphite-composite material. Molded ribs increase the chassis' rigidity. The motor is offset on the chassis' left side and, to compensate for the weight bias, the battery is on the chassis' right side. This allows a side-by-side 6-cell pack to fit directly into the car without any messy jumpers, and the chassis also accommodates stick packs. This is great news for racers who swap packs between their off-road and touring cars. The slots accept today's higher-capacity cells (2000 to 3000mAh) without chassis modifications, and they are beveled to keep the cells as low on the chassis as possible. A plastic quick-release battery strap holds the pack securely in place. A slot has also been removed to cool the motor and to allow it to sit as low as possible. All of the exposed screws on the bottom are now Allen-heads, which replace the previous model's Phillips-head screws, and they are fully counter sunk in the chassis.

The new "Worlds spec" upper deck is an exact replica of the one on the 2000 IFMAR Worlds champion. For additional chassis flex, material in the brace's front and rear sections has been removed. It attaches to the front and rear bulkheads and to the aluminum motor-mount for reduced longitudinal flexing.

• **Suspension and steering.** The WCR's suspension is exactly like Hara's winning setup. The long, graphite-composite lower A-arms permit the chassis to roll easier, which is better in slippery conditions. The new



The threaded shock bodies offer quick tuning. Check out the trick clamping hubs. Say goodbye to lost roll pins and hubs. These guys are staying on!

front A-arms have molded ball ends that work with the included front swaybar and two shock-mounting positions. The front hub carrier has an extended "C" design that places the hinge pin past the steering knuckle's pivot point. You have two choices for mounting the hub carrier, and changing its position changes the front suspension's roll center slightly. The WCR has Hara's setup of the lower of the two mounting locations. In both the front and rear, the upper titanium turnbuckles use a ball cup on the inboard side of the link and a captured cup on the hub side. I like this setup because it reduces the chances that one will pop off in a brush with the pipes and one normal ball cup makes for easier maintenance.

Extra long A-arms are in the car's rear end, and as in the front, they have an adjustable titanium upper

KO Propo EX-11 Presto

and KR-297FZ receiver
The EX-11 offers a clean FM signal and a comfortable grip. The Presto has the features of more expensive radios, including digital trims, endpoint adjustments and steering/throttle dual rates. It's a great mid-level radio, and the small, light receiver fits into the tightest spaces.

KO Propo PDS-2143FET steering servo

The 2143 offers digital technology, and that means higher torque, holding power and better centering performance. KO claims output of 111 oz.-in. of torque and 0.08-second transit time. This provides more than enough performance for most applications.

GM Racing V-12 ESC

The V-12 offers push-button setup, turbo start and an external current limiter. The V-12 also has external solder tabs for the wires. The V-12 packs all this performance into a small package that can still handle low-turn mods.

Reedy R3K 3000 Panasonic cells

The Panasonic cell has become one of the dominant power sources for modified racing. The voltage continues to improve, and run time is hard to match. This pack was Reedy-matched at a 30A discharge rate, and it produced good power and run time.

Reedy 8x3 Millennium Wind motor

Mike Reedy claimed his 22nd Worlds victory as a motor manufacturer. With a unique wind pattern that uses different gauges of wire for better rpm, the MW motors are Reedy's best. The 8x3 that I used performed very well in the Yoke—just as it did for Atsushi in Japan.

Hara's Worlds winning setup

Do you want your car to run as much like Hara's as possible? Use his exact setup, and see what the pros like to drive:

	FRONT	REAR
Toe-in	0°	1°
Ride height	4.6mm	5mm
Camber	-1.5°	-2.0°
Camber-rod location—bulkhead	2	1
Caster	3°	—
Hub position	1	3
Anti-squat	—	0°
Roll bar	1.2mm	1.2mm

SHOCKS		
Fluid	450WT	500WT
Piston	No. 3	No. 3
Spring	Yellow	Yellow
Length	59.7mm	60mm
Mounting location (upper/lower)	1/2	5/2

Motor—Reedy MW 8-double	
Pinion/spur	21/78



THE COMPETITION

	Drive train	Chassis material	Chassis	Diffs (F/R)	Shocks	Street price*	Reviewed
Associated TC3	Shaft	Composite	Tub	Ball	Alum.	\$225	02/00
HPI RS4 Pro 2	2-belt	Woven graphite	Double deck	Ball	Alum.	\$219	05/99
Tamiya TA04 Pro	2-belt	Woven graphite	Double deck	Ball	Plastic	\$308	12/00
Schumacher SST Axis 2	2-belt	S1 composite	Double layered	Ball	Alum.	\$219	03/01
Yokomo MR-4TC Pro WCR	2-belt	Graphite composite	Graphite tub	1-way/ball	Alum.	\$299	04/01

*Approximate; price varies with dealer.

camber-link. Two shock-mounting positions are available. The rear has a fairly thick swaybar. The rear hub carriers have two camber-link locations and two roll-center locations for maximum tuning options.

Front and rear shock towers are molded graphite and are extremely stiff. The front has three shock-mounting locations and six camber-link locations for additional tuning. In the rear, you also have a choice of five shock-mounting locations and seven camber-link locations for added tuning options.

Yokomo's normally optional, blue threaded-body aluminum shocks are included in this kit and have been mounted on each corner. The shocks are sealed by double O-rings and are similar to Associated VCS shocks in that the foam inside the shock compensates for the shaft's volume when compressed. This allows the shocks to operate with a minimum of emulsified air. Small screws in the plastic shock caps allow the shocks to be bled easily. Each shock has a powder-coated yellow spring.

Steering has a molded-graphite bellcrank system with a built-in servo-saver. You can increase the tension on the unit by turning a large knob on the bottom of the unit. For less wear, each bellcrank side rides on metal-shielded bearings. The steering turnbuckles, steering link and Ackerman link are all Yokomo titanium.

• **Drive train.** The WCR has a dual-belt system, and its layshaft has been positioned lower than the motor, so the car has a low center of gravity (CG). New to the kit are narrower belts and diff pulleys. The narrowed belts reduce friction and improve the car's efficiency at the cost of more wear on the belt. The front belt rides on a lightweight, blue aluminum pulley that has a one-way bearing installed. A ball-bearing belt guide routes the belt through the motor mount, but it can't be used to change the belt tension. The rear diff uses a new narrowed pulley to accommodate the new belt. A ball differential distributes power to the rear wheels. There are rubber-sealed bearings in both the front and rear diff outdrives. These are the only places rubber seals are used on the car; the rest of the WCR gets metal-shielded. These bearings are not as well protected against contamination as rubber-sealed units, but shielded bearings do offer less rotating resistance, and at the Worlds, every bit counts.



The car has two one-ways; one is on the front. It replaces the differential and allows the front wheels to freewheel when coasting but also prevents the front wheels from providing any brake action.

The front differential included in the Pro kit has been replaced by a front one-way pulley so the front wheels can freewheel when they are off-throttle. As a result, less speed is lost during coasting because the motor's drag is amplified throughout the entire drive train, and you can apply the brakes as if it's a 2WD car. It's less stable in hard braking and tight track conditions, but on a long, twisty track, the reduced friction is very noticeable. The front one-way pulley uses hardened outdrives, and the rear uses the molded plastic outdrives. Because both the plastic and aluminum outdrives are lightweight, they help to reduce rotating mass and allow quicker acceleration. CV-style, blue aluminum axles distribute power to each wheel. The lightweight, efficient axles are currently a racecar standard.

The cast-aluminum motor mount dissipates motor heat. An additional cast-aluminum cooling fin has been fitted to an opening in the chassis' bottom. A 78-tooth, 48-pitch spur gear and a 22-tooth pinion



The new top deck features the same design that was used at the Worlds. With material removed from the front and rear sections, the chassis has more flex and gains traction on slippery surfaces.

are included in the kit. An aluminum adapter allows you to use a Yokomo spec diff gear. To use a standard gear, just take off the adapter and bolt on a standard spur gear.

• **Body, wheels and tires.** The kit comes with an Andy's Dodge Stratus body, Hara's choice at the Worlds. To date, the Dodge Stratus is still the most popular sedan body at the Worlds level. The wheels are Yokomo's own aero-dish type. The dish design reduces wheel flex. The belted, 5G tires are some of Yokomo's best racing tires with plenty of grip for slippery, untreated asphalt. The molded firm inserts are an added bonus. You might have a great tire, but without the right insert, traction may not be optimized. These firm inserts worked well on the slippery Worlds surface and should work on most asphalt surfaces.

PERFORMANCE

The WCR is ready to attack a fairly large asphalt track. I tested the car on a tight technical track that allows foam tires at RC Madness in Enfield, CT. I purposely went on a non-race day so I could get some good-quality time alone with the car. My first task was to change the springs. I used Yokomo brown up front and gray in the rear, and this made the car extremely stiff. I then swapped tires to a set of Jaco foams that I had tried to race height. I also switched to a Trinity Green Machine 3 (the Reedy 8x3 was just too much motor for the track). With my starting setup in place, I set the car on the track.

After a few slow warmup laps, I started to pick up the pace. I was very surprised that the car handled so well with its double one-way setup. I expected it to be a little loose off-power, but that wasn't the case. After I adjusted the dual rate, the car carried speed very well through the corners. Both on- and off-power steering were excellent. The car also had a fairly quick rotation through the corners and made for some very impressive lap times. Even before I had one pack through the car and a good feel for the layout, I was able to attack the track very aggressively. Acceleration was average for such a tight track, and braking wasn't a problem (I never really used the brakes, thanks to the track's flowing layout). After the initial tire-traction compound wore in, the rear did lose some traction, but I cured that with a lengthier application of traction compound and some thicker oil. After half a dozen or so runs and some minor camber tweaks, the car's performance was awesome. I'd say it was one of the best cars that I have driven in some time.

THE VERDICT

The Yokomo MR-4TC WCR is more than the World Champ; it's a top-of-the-line touring car with all the goodies you could want. In addition, these parts make the WCR an excellent performer on the track. From the box to the track, the WCR was nearly perfect, and there aren't many cars like that—especially ones that run on carpet. As an accurate replica of Atsushi Hara's IFMAR Worlds-winning MR-4, I expected nothing less and am glad to say I wasn't disappointed. ■

SOURCE GUIDE

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YOKOMO USA
Airport Business Center, 17951
Skypark Cir., Ste. K, Irvine, CA
92614; (949) 252-8663;
www.yokomousa.com.

GS Racing Sonic

1/8-scale on-road for everyone by George M. Gonzalez





Referring to 1/8-scale, nitro-powered on-road cars as the "Formula 1 cars" of RC racing has perhaps become a bit of a cliché, but like full-scale F1 cars, 1/8-scale on-road cars have incredibly high power-to-weight ratios, and that means they're among the fastest and most challenging RC vehicles to pilot. But because of their sophistication, generally high cost and the skill level required to build, drive and maintain them, 1/8-scale on-road vehicles have been somewhat less popular in the U.S.

The people at GS Racing want to change how 1/8-scale on-road cars are perceived in the U.S., and they have released a product that should make this exciting racing class more appealing to everyday enthusiasts. The GS Racing Sonic is the first affordable, ready-to-run, 1/8-scale, fuel-powered, on-road racecar that's geared toward newcomers who want to go fast—really fast—in a hurry. Is this new RTR super car really beginner-friendly? I hope that you're as eager to find out as I am.

DATA CENTER

VEHICLE TYPE 1/8-scale, nitro-powered, on-road car

BEST BUYER Intermediate or second-time RC buyers who want to experience the thrill of 1/8-scale nitro racing but who don't want to take out a loan to get started

KIT RATINGS (poor, satisfactory, good, very good, excellent)

Instructions Satisfactory

Parts fit/finish Good

Durability Very good

Overall performance Very good

SPECIFICATIONS

MANUFACTURER GS Racing

MODEL Sonic

DISTRIBUTED BY Horizon Hobby

SCALE 1/8

STREET PRICE \$549

DIMENSIONS

Wheelbase 11.5 in. (292mm)

Width (F/R) 7.36/7.34 in. (187/186mm)

WEIGHT

Total, as tested 85.45 oz. (2,421g)

CHASSIS

Type Double deck

Material Aluminum

DRIVE TRAIN

Type Belt-drive 4WD

Transmission 2-speed centrifugal

Drive shafts (F/R) Dogbones

Differentials None

Bearing type Shielded ball bearings

SUSPENSION

Type Double wishbone

Damping Coil-over, oil-filled shocks

WHEELS

Type One-piece nylon

TIRES

Type Rubber slicks with urethane inserts

ENGINE AND ACCESSORIES

Engine GS Racing R01 .21 rear exhaust

Starter None

Carb Twin-needle slide with 8mm venturi

Exhaust Tuned pipe and header

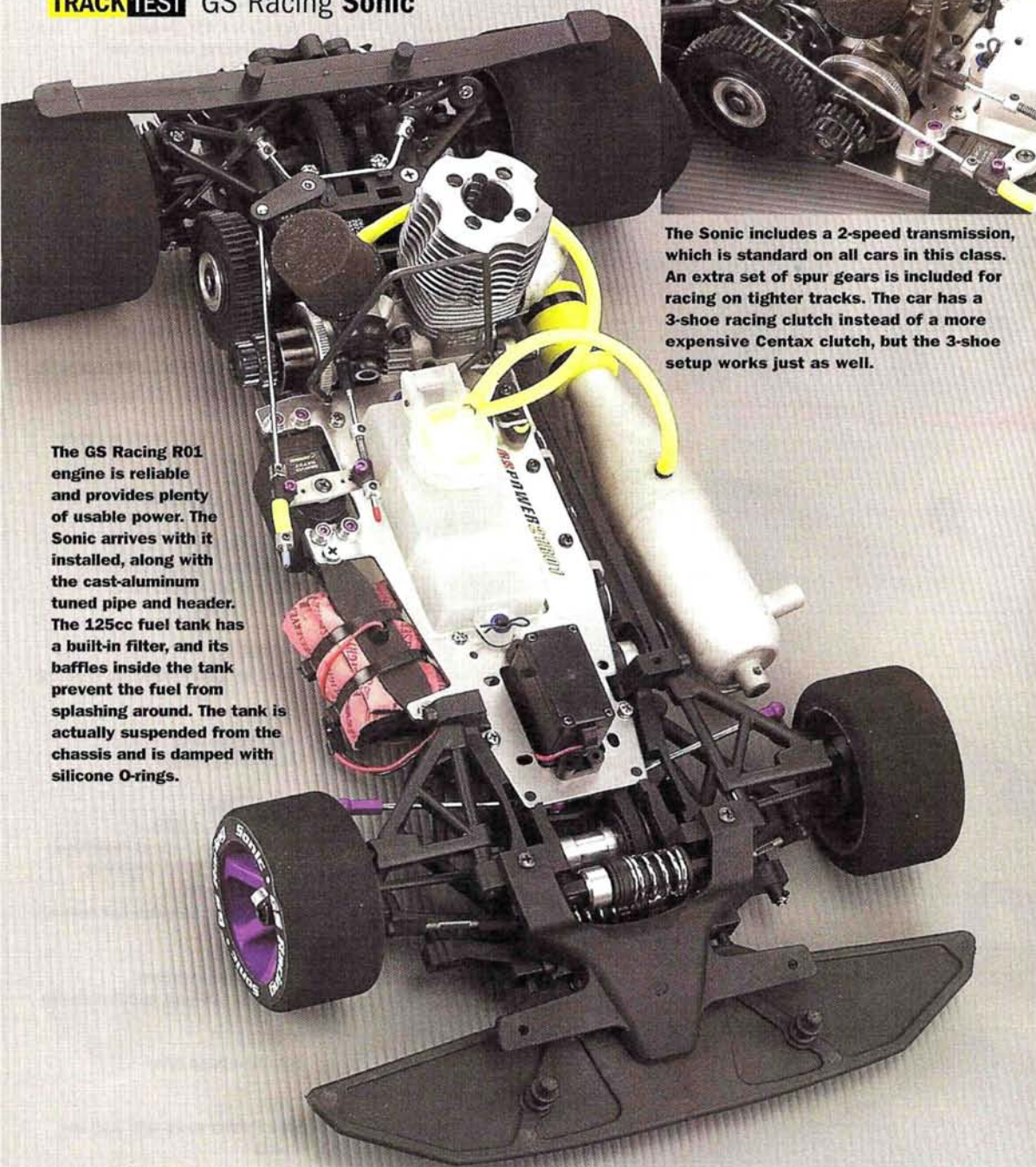
Fuel capacity 125cc

LIKES

- Super-fast and exciting.
- Great handling.
- Easy-to-tune suspension.

DISLIKES

- Instructions.
- Foam tires don't last long.
- No turnbuckles.



The GS Racing R01 engine is reliable and provides plenty of usable power. The Sonic arrives with it installed, along with the cast-aluminum tuned pipe and header. The 125cc fuel tank has a built-in filter, and its baffles inside the tank prevent the fuel from splashing around. The tank is actually suspended from the chassis and is damped with silicone O-rings.

The Sonic includes a 2-speed transmission, which is standard on all cars in this class. An extra set of spur gears is included for racing on tighter tracks. The car has a 3-shoe racing clutch instead of a more expensive Centax clutch, but the 3-shoe setup works just as well.



building & setup tips

Even though the Sonic arrives fully assembled, there are still quite a few things to do to it. The car comes with a giant assembly manual and a supplemental page that directs you to certain steps in the manual to complete the radio installation and other tasks. Intermediate to advanced racers won't have problems installing the radio gear on the chassis, but beginners may need some help getting the throttle and brake linkage sorted out. Here are a few tips that might help.

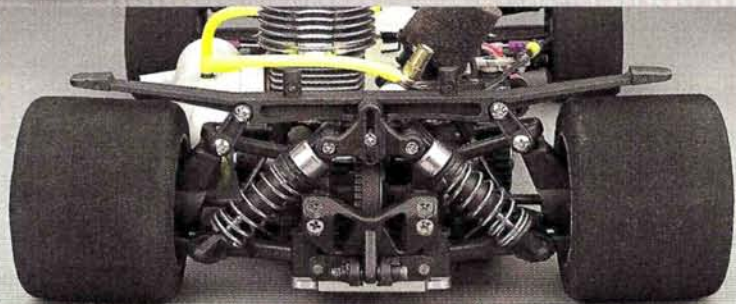
Radio. You should purchase an FM radio system for this model. FM radio systems are more glitch-proof than AM units and have useful features such as endpoint adjustment and steering and throttle dual rates.

Step 3. The instructions show you how to install the throttle servo with small tie-wraps. This system does work, but I used a more conventional system: I secured the servo to the chassis with four 2.5x12mm cap-head screws and four, 4mm locknuts. I threaded the screws through the rubber servo-mounting bushings that come with the servo to reduce vibration.

Step 5. Before you install the steering servo and steering rods, you'll need to widen the car's front to 251mm by loosening the pillow balls that secure the front hub carriers to the upper and lower wishbones. You'll need a 3mm Allen wrench (not included) to loosen the pillow balls. After you've installed the servo, adjust the length of the steering rods so the car has zero toe-in. You'll also want to check your camber settings with an RPM or Serpent camber gauge. Remove the rear tires, and place the car on them so the front wheels are off the ground; then adjust each front wheel so it has zero camber. When the car settles at ride height, it will yield close to 1 degree of negative camber.

Step 7. The kit includes clip-on preload spacers in various sizes to adjust ride height. You'll need to install them on all four shocks to achieve the proper ride height. The front dogbones should be level with the track surface and the rear dogbones slightly above level. The shocks come filled with 30WT oil, in case you're wondering.

The plastic body shocks on the rear end worked very smoothly and didn't need any attention. Rear toe-in, rear width, camber, swaybar tension and ride height are all easy to adjust. Note the floating body mount and included foam tires.



YOU'LL NEED ■ Two-channel radio system and two servos ■ 5-cell side-by-side (flat) receiver battery pack ■ Glow-plug igniter ■ Starter box ■ Fuel (20-percent-nitro recommended) ■ Paint for the Lexan body ■ Extra glow plugs

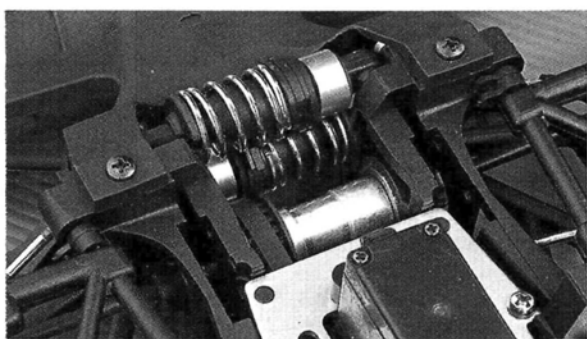
FACTORY OPTIONS Only a few hop-up options were available at press time. GS Racing is currently testing a pro-level version of the Sonic called the "Super R." Many of the features on this car will eventually be offered as performance options for the Sonic. Expect a graphite radio tray, a 7075 T6 aluminum chassis and many other aluminum-alloy components to be available soon. Here are a few items you'll be able to get right away.

■ Aluminum, threaded-body shocks—part no. 582-514 ■ 1.4mm hardened-steel brake disc—582-412 ■ 45-tooth spur gear (first gear)—581-640 ■ 51-tooth spur gear (second gear)—581-644

KIT FEATURES

• **Chassis.** The Sonic features a 5mm-thick, 6061 T6 machined-aluminum chassis. The chassis' holes are fully countersunk, and it has large openings underneath the front and rear drive pulleys and fuel tank to reduce weight and prevent small rocks and other debris from collecting on the chassis. The gunmetal gray anodizing is a nice touch, and it gives the Sonic an all-business disposition.

A 2mm-thick 6061 T6 aluminum upper deck is attached to the front bulkheads and the molded radio-plate supports that are in front of the engine. The upper deck increases chassis rigidity and houses the steering and throttle servos, the receiver, the receiver battery pack and the 125cc primer-less, filtered fuel tank. You'll be able to remove the upper deck by loosening four screws, and the fuel tank features quick-release mounts that let you remove it by pulling out a couple of body clips. Believe me; these are nice features to have once maintenance time rolls around.



The front body-mount plate has been removed so you can see the Sonic's unique, laydown, inboard shock system. Tie rods that are installed in the lower wishbones push up on pivoting shock bellcranks when the suspension is compressed; this, in turn, compresses the shocks. This shock-mounting system works very well. Also visible is the adjustable swaybar.

• **Suspension.** The Sonic features a fully independent, adjustable suspension, which is expected on vehicles of this type but goes far beyond the adjustment capabilities of most RTR vehicles. There are upper and lower wishbones at the front and the rear, and there's a unique laydown shock system up front. Adjustable swaybars and plastic-body, oil-filled shocks equip the front and rear suspension systems. The front swaybar is the ball-and-cup variety that is now standard issue on cars in this class. You can make front swaybar tension adjustments by adjusting the eccentric mounting cam that secures the left swaybar mount to the left lower wishbone. To adjust the thick rear swaybar, simply slide its connecting links inward or outward. The shocks feature O-ring seals and aluminum caps, and although they may not be as trick as the aluminum, threaded-body shocks that are found on more expensive cars, they work very well and are light.

The front upper wishbones pivot on extra-long, captured hinge pins that allow you to move the wishbones forward or backward to adjust caster. Clip-on spacers let you make quick and accurate caster adjustments. The lower front wishbones pivot on pillow balls and provide exceptionally smooth action. Large-

diameter threaded pillow balls attach the front hub carriers to the upper and lower wishbones. Camber and front width are adjusted by altering the depth of the pillow balls. By loosening or tightening setscrews that are threaded into the front and rear lower wishbones, you can make downstop adjustments. Threaded steering rods allow toe-in/-out adjustment, but tie rods would make the job easier.

The rear hub carriers are attached to the lower wishbones with hinge pins, and the upper wishbones, with pillow balls. Eccentric, molded hinge-pin sleeves installed in the rear hub carriers and upper wishbones allow you to choose from several preset camber settings on each rear wheel independently. This is a nice feature because it means you can make precise camber adjustments without using camber gauges or other setting tools. There are four metal shims on each rear axle, and they can be individually relocated to the inside of the hub carriers to narrow the rear track. The Sonic is assembled with all four shims on the outside of each rear hub carrier behind the drive pins (to provide maximum rear width). Like most other 1/8-scale on-road cars, the Sonic features a floating rear body mount that transmits downforce directly to the wheels instead of to the chassis.

• **Drive train.** The Sonic features a locked, main rear pulley (no differential) and a one-way, bearing-equipped main front pulley. Various sizes of pulleys are used throughout the drive train to provide a slightly higher ratio to the front wheels than to the rear wheels. Because the front tires are smaller in diameter than the rear tires, the front-to-rear drive ratio somewhat evens out. Many racers will want to alter this ratio to provide overdrive—a ratio that refers to the balance of front and rear drive. You can change the overdrive ratio by changing the size of the side belt's outer front pulley or by truing the tires to different diameters. Overdrive of less than 1 (less than a 1:1 ratio) means that the rear wheels are driven faster than the front wheels. Overdrive of more than 1 (more than a 1:1 ratio) means that the front wheels are driven faster than the rear wheels, and overdrive that equals 1 means that the front and rear tires are driven at the same rpm. Hardcore racers routinely experiment with overdrive ratios during the dialing-in process, but most RC enthusiasts will not have a tire truer at their disposal, so they'll just bolt on the tires and run them down to the wheels.

The Sonic has large-diameter belts and heavy-duty flanged pulleys, and the entire drive train (including the wheels) spins on shielded ball bearings. Steel dog-bones transfer the power to the wheels. The Sonic includes a nice, self-adjusting belt tensioner with a bushing-equipped, stainless-steel roller for the center belt. There aren't any belt-tensioning devices for the front and rear belts, but they should last quite a while before they need replacing. A vented, stainless-steel disc brake with steel calipers and rubber brake pads provides stopping power.

The Sonic uses a conventional, 3-shoe racing clutch instead of the Centax, or ball-type, clutch systems

Hitec Lynx 3D radio system

My 3D is equipped with Hitec's Spectra module that has every 75MHz TX frequency locked into its memory. I also used Hitec's awesome dual-conversion DCX receiver that filters the signal twice for glitch-free operation. To protect it from the elements, I placed the receiver inside a Hitec foam-insulated flight protector before installing it on the receiver mount with tie-wraps.

Airtronics 94157 steering servo

The Sonic includes a heavy-duty servo-saver, but it isn't universal. Since the servo-saver is designed for Airtronics/Sanwa servos, I enlisted an Airtronics 94157 high-speed/high-torque servo to handle the steering duties. I paired the steering servo with an Airtronics 94737 throttle/brake servo. This servo combination has served me well on many other nitro-powered racing applications.

FMA Direct 600mAh Ni-Cd receiver pack

A 5-cell, flat receiver battery pack must be used because of the limited space underneath the top deck and the particular design of the battery mount. I used an affordable FMA Direct 600mAh Ni-Cd receiver battery pack. I ran seven tanks of fuel through the engine before I noticed that the batteries needed recharging.

Trinity 25-percent Monster Horsepower fuel

GS Racing recommends 20-percent-nitro fuel for the engine. I thought I had picked up a gallon of Trinity 20-percent Monster Horsepower fuel at the hobby shop, but when I got home, I noticed that I had accidentally picked up a gallon of 25-percent fuel instead. I went ahead and used the fuel with excellent results.

OFNA universal starter box

You'll need to get a starter box to fire the engine up. GS Racing has a sleek-looking box that is more than up to the task of starting the Sonic's big-block .21; however, my OFNA universal starter box was conveniently set up and ready to go. This starter box features a universal design that can be quickly set up to accommodate many types of nitro RC vehicles and is powered by a couple of 7.2V battery packs.

that are common on more expensive models. The 3-shoe setup works just as well, but it can't be adjusted unless you remove material from the clutch shoes to provide a higher stall rate. A lightweight aluminum flywheel and threaded clutch bell with removable gear clusters complete the clutch package. A 2-speed transmission is also standard, and it features nylon spur gears and a cam-type centrifugal clutch with an adjustable shift point. An alternate set of spur gears lowers the first and second gear ratios for racing on tight tracks. The stock spur gears will provide maximum top speed and make the car easier to drive on slippery surfaces.



Notice the four shims installed just behind the drive pin. These shims can be individually relocated to the inside of the hub carrier to narrow the rear track. Check out the gigantic bearings seated inside the hub carriers and the quick-release tang that allows superfast wheel changes without any tools.

- **Engine and accessories.** The Sonic comes with GS Racing's R01 .21 racing engine. This 3-port, rear-exhaust engine is more mild than wild, but it has more than enough power to give any racer a white-knuckle driving experience. It features ABC construction for long piston and sleeve life, a bushing-equipped connecting rod, a tall, silver-anodized heat-sink head, a twin-needle slide carb with an 8mm bore and a foam air-filter element. A cast-aluminum header and tuned pipe are also included—and installed—on the engine.

The fuel tank is suspended from the upper chassis deck and damped with silicone O-rings to help prevent the fuel from foaming. A super-strong front bumper and front body-mount plate protect the chassis and front suspension from those occasional run-ins with the boards.

- **Body, wheels and tires.** The Sonic includes a cool-looking, closed-cockpit GT-1 Porsche body. Serious racers prefer the downforce characteristics that an open cockpit Lola-style body provides, but I think the Porsche body has much more stylish looks and will appeal to full-scale racing enthusiasts. Cut lines and body-post locations are clearly marked, and the body is covered with a protective overspray film.

The Sonic includes a complete set of approximately 35-shore foam tires mounted and trued on black nylon wheels. The wheels are Serpent-compatible, so finding spares in a variety of compounds shouldn't be an issue.

PERFORMANCE

I had the Sonic set up and running in less than two hours (not including body-prep time, of course). Relying on the factory-adjusted carb settings, I placed the car on my starter box and pushed down to fire the engine up. It fired immediately and settled into a nice, steady idle. With the car on the starter box, I let the engine idle through the first tank of fuel, which it did without stalling. I leaned out the high-speed needle and ran the car with the body off so that it received maximum cooling.

The engine ran a little rough with the overly rich carb setting, but it felt as if it wanted to launch the car into outer space whenever I blipped the throttle and the carb cleared its throat. I let the engine cool down between tanks and continued to lean out the high-speed needle in increments. By tank number six, the Sonic was screaming down my street at full clip with a beautiful trail of gray smoke exiting the tuned pipe and a top speed of just over 60mph. I knew that my carb tuning was in the ballpark because the car faithfully shifted into second gear whenever I made a high-speed pass. When I checked its temperature, I found that the engine was running at a pleasant 235 degrees.

My street had recently been repaved, but for some reason, the workers had decided that we needed a lone warning reflector bonded to the asphalt at the bottom of the cul-de-sac. I never noticed it until the Sonic suddenly caught some air, did a slow flip, landed upside-down on its roll bar and then slid about 15 feet, straight into the curb. Other than scratching the heat-sink head and some of the plastic, it was fine. It was time to put on the body!

I was pleasantly surprised with the car's handling. Despite the dusty, dirty street conditions, the Sonic had plenty of traction and was easy to drive. It exhibited a slight push at the limit and almost too much steering at slower speeds, but I was able to control it at all times. The car's straight-line stability was excellent, and even though I never really tuned the engine for maximum performance, its top speed was downright scary. I was impressed with the Sonic's overall performance, and with a little suspension tuning, I know that I could get it dialed at any track. I did find out, however, that there is a price for this kind of performance: tire wear is atrocious. After about 12 tanks, the front tires were worn down to the wheels, and the rear tires had severe chunking.

THE VERDICT

Even though the Sonic is an RTR car, I am still a little hesitant about recommending it to beginners. It's just too much car for first-time racers. It also requires special equipment to run, such as a starter box and a middle-of-the-road FM radio system, at the very least. I would, however, recommend the Sonic to someone who has had some experience with nitro vehicles and to someone who has owned an electric car or two and understands suspension tuning and chassis dynamics.

Is the Sonic the right car for you? Ask yourself the following questions: do you want the ultimate RC on-road experience but don't want to take out a loan to get started? Are you looking for a super-fast car to impress your friends but don't want to spend hours, if not days, building and setting it up? If you answered yes to any of these, the GS Racing Sonic might just be the car for you. ■

SOURCE GUIDE

AIRTRONICS 1185 Stanford Ct., Anaheim, CA 92805; (714) 978-1895; www.airtronics.net	HORIZON HOBBY INC. 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; www.horizonhobby.com
FMA DIRECT 9607 Dr. Perry Rd. #109, Ijamsville, MD 21754; (800) 343-2934; www.fmadirect.com	OFNA RACING 22692 Granite Way, Ste. B, Laguna Hills, CA 92653; (949) 586-2910; www.ofna.com
GS RACING distributed by Horizon Hobby.	RPM INC. 14978 Sierra Bonita Ln., Chino, CA 91710; (909) 393-0366
HITEC RCD INC. 12115 Paine St., Poway, CA 92064; (858) 748-6948; www.hitecrad.com	SERPENT INC. USA West Park Center, 2830 NW 79th Ave., Miami, FL 33122; (305) 639-9665; www.hudy.net

2001 REVERSING ESC

Electric RC kits have come a long way since the hobby's early days, but one area in which time seems to have stood still is original-equipment speed controls. Some ready-to-run kits include electronic speed controls (ESCs), but all electric you-build-it kits include mechanical speed controls (MSCs)—if a controller is supplied at all. There's nothing wrong with an MSC—you pull the trigger, the motor runs; it works. But your car or

truck isn't running as long per charge, or accelerating as smoothly, or operating as reliably as it could if it were equipped with an ESC.

And that brings us to the topic of this guide:

reversing ESCs. From A to Z (well, at least "T"; no ESC manufacturer names start with "Z") reversing

ESCs are compared here. One is right for your vehicle and budget, and we provide all the info you need to make a pick.

AIRTRONICS CONTENDER

The Contender has been in Airtronics' line for a long time now, and it shows in features such as its large, integral heat sink, servo-type mounting tabs and manual setup. A factory-set reverse delay helps prevent the gearbox from being damaged, and plug-in installation makes it easy to upgrade from an MSC. The Contender is sold separately and is also offered with some Airtronics radio sets.



- Tamiya battery plug and bullet connectors for drop-in replacement of an MSC.
- Designed for use with 27-turn stock and similar motors.
- LED indicators to show correct neutral and full-throttle settings.

DURATRAX BLAST

The Blast is definitely "old-school," with its large heat sink, servo-style mounting tabs and manual setup, but it is tough and reliable—and inexpensive. Overload protection kicks in to prevent it from frying if you jam

the motor, and a large aluminum heat sink helps cool the FETs. A 1/2-second delay before reverse kicks in helps to protect your gearbox, and a soft silicone boot under the heat sink soaks up vibration to increase durability. If you're replacing a mechanical controller, a Tamiya battery connector and bullet plugs make for drop-in installation.



- Manual setup with LED indicators for neutral and full throttle.
- Removable servo-type mounting lugs.
- Silicone heat-sink boot for better cooling and FET protection.
- Fixed reverse delay (0.45 second).
- Tamiya battery plug and bullet connectors for drop-in replacement of MSC.

DYNAMITE POWER PULSE

You've no doubt noticed that your car's steering gets sluggish and may stop responding entirely as the battery dumps; to avoid this, the Power Pulse has Power Boost circuitry that maintains full servo power for as long as possible, so you stay in control. If you get a little too crazy with a mod motor or

another overload situation, the Power Pulse will pop its internal replaceable fuse before anything goes seriously wrong.



- Power Boost circuitry maintains steering-servo voltage when battery power runs low.
- Reverse-polarity- and overload-protected with replaceable fuse.
- 1-second reverse delay.
- Proportional brake.
- Tamiya battery plug and bullet connectors for drop-in replacement of MSC.

FMA DIRECT VOLCANO

The Volcano is a full-featured ESC with such niceties as push-button setup, 1000Hz switching (translation: smooth throttle feel) and a cool purple heat sink. The most interesting feature is its antilock braking system (ABS), which pulses the brakes to help prevent the wheels from locking. This feature can be switched off for full braking power if you wish. The ESC is thermal-overload protected and will shut itself down if you overheat it, so your Volcano won't turn into a volcano!

GUIDE

BACK THAT THING UP!



- Push-button setup.
- Can be set for standard or ABS braking.
- Push/Pull Pause Protection circuitry does not engage reverse until the motor has stopped.
- 1000Hz switching for smooth operation.
- Tamiya battery plug and bullet connectors for drop-in replacement of an MSC.
- For use with stock and modified motors down to 12 turns.

FUTABA MC230CR AND MC330CR

The old MC210CB black box has gone, and Futaba has replaced the classic with two new, modern controllers: the MC230CR (which hits the same price point as the old CB) and the MC330CR (a more robust model that otherwise looks and operates like the 230). Both units feature reverse lockout for racing, push-button setup, over-



load protection and a "power on" alarm. The difference between the two ESCs is motor compatibility: the 330 CR is rated for mod motors down to 13 turns, while the 230 is limited to winds of 20 turns or more.

- High-frequency 1500Hz switching for smooth throttle.
- Reverse can be disabled for racing.
- Electronically protected against overheating and excessive amp draw.
- Power-on alarm sounds if unit is switched on but receives no signal.
- Tamiya battery plug and bullet connectors for drop-in replacement of an MSC.
- For use with motors down to 13 turns (MC330CR) or 20 turns (MC230CR).

HITEC

Hitec's long-lived SP ESCs aren't filled with features, but they are reliable, economical and built to last. Both models use silicone boots between the FETs and heat sink to help transfer heat and damp vibration, and servo-style mounting tabs allow you to bolt the ESC in instead of using tape (no room for servo mounts?; the tabs are easy to remove). The 560 allows you to adjust reverse delay; on the 520, delay is fixed.

SP520+

- Silicone heat-sink boot for better cooling and FET protection.
- Fixed reverse delay (0.45 second).
- Manual setup with LED indicators for neutral and full throttle.

Why is an ESC better?

To understand the benefits of an ESC, you must first understand the basic nature of a battery: it's either "on" or "off," and that's it. As soon as your radio trigger moves from neutral to forward throttle—regardless of how far it moves—the pack pumps a full 7.2 volts. Now, we know the car doesn't just go at full throttle all the time, so where is the "extra" juice going? In the case of a mechanical speed control (MSC), battery power is sent through a resistor on its way to the motor. To travel at $\frac{1}{2}$ throttle, half of the pack's voltage is burned off by the resistor as heat, and the other half goes to the motor. As you might guess, that isn't an efficient way to control throttle.

An ESC works on an entirely different principle. Instead of wasting power with a resistor, an ESC switches the motor on and off very quickly to control a car's speed. The on/off pulses are very fast—60 cycles per second (60 hertz) at the very least, with switching rates as high as 4000 hertz or more in the most advanced models. The higher the switching rate (better known as "frequency"), the smoother the throttle feels and the more efficiently the ESC operates.

In addition to giving you longer run times and more precise throttle control, an ESC lightens and neatens your car by doing away with the MSC and the throttle servo and linkage required to operate it. An ESC also requires much less maintenance—as in none.

With the exception of the extra dough it will take to upgrade your car to an ESC, there's absolutely no downside to swapping your MSC for any one of the electronic units in this guide.

ESC Glossary

Battery eliminator circuit (BEC): the term "battery eliminator" comes from the early days of RC when electric vehicles required a 4-cell receiver pack. The BEC in a speed control is actually a voltage regulator that supplies the receiver and servo with the voltage they need to operate. We've listed the BECs' output in volts and amps; if you plan to use high-power servos, try to get an ESC with a high-amp BEC.

Cells: when referring to an ESC, this means the number of cells it can safely operate with.

Current limiter: allows the user to reduce the current delivered to the motor to extend run time. A current limiter can also be used to reduce wheelspin on slippery tracks, although with some units, this can also limit top speed.

FET (field-effect transistor): a transistor in which the output current is controlled by a variable electric field. An FET is a voltage-controlled power device that can handle large flows of electrical current. The metal tabs on top of an ESC are the heat sinks for the FET (some tabs may also be for the voltage regulator, BEC, or brake).

Frequency: to oversimplify, an ESC controls the speed of the motor by cycling the motor on and off many times per second. The number of cycles per second

is the frequency. It is generally accepted that higher frequencies result in a smoother throttle feel.

Manual setup: many ESCs now have push-button setup for quick calibration, but some are "manual" and require that you turn one or two small potentiometer (pot) knobs, to set the ESC's neutral and full-throttle positions.

Motor limit: some ESCs overheat if required to cope with the amp draw of a modified motor with very low winds, so their manufacturers specify the minimum number of motor winds they can safely be used with. The motor limit is only a guideline; even when operated with an "approved" motor, an ESC may overheat, shut down, or be damaged if the motor is jammed or severely overgeared.

Resistance: the amount of electrical resistance within an ESC's transistors. Resistance changes electrical energy into heat energy; for us, that means power is wasted as heat. The figures listed for resistance will help you compare speed controllers within each brand listing, but since not all manufacturers measure resistance the same way, one maker's rating may not be a reliable tool for comparison with another's.

Overload protection: this feature will shut down an ESC if it overheats because of overuse, a short

circuit, or another problem. Once the ESC has been allowed to cool, it will operate normally. Most ESCs with this feature use thermal-overload protection to monitor temperature. If your ESC gets hot enough to activate this feature, find the cause and fix it!

Proportional brake: proportional control means that the car reacts in proportion to the input from the transmitter; for example, if you turn your transmitter wheel just a little, the car turns slightly. The farther you turn the wheel, the tighter the turn gets. Proportional brake can be applied gently for a gradual stop or more heavily until you reach a wheel-locking spinout (or anywhere in between).

Proportional reverse: this allows you to control reverse throttle from slow to fast and anywhere in between—just like forward throttle.

Push-button setup: this allows you to push a button to automatically calibrate your ESC to your radio's neutral, throttle and brake positions.

Reverse disable: once activated, this will allow full control of forward throttle and brake, but reverse will not function. This allows an ESC to comply with the rules of most tracks and race-sanctioning bodies, which prohibit the use of reverse in competition.



- Removable servo-type mounting lugs.
- Tamiya battery plug and bullet connectors for drop-in replacement of an MSC.

SP560 HEAVY DUTY

- Adjustable reverse delay (0.1 to 1 second).
- Silicone heat-sink boot for better cooling and FET protection.
- Manual setup with LED indicators for neutral and full throttle.



MANUFACTURERS' SPECIFICATIONS

	Airtronics	DuraTrax	Dynamite	FMA Direct	Futaba		Hitec		Keyence	
Model	Contender	Blast	Power pulse	Volcano	MC330CR	MC230CR	SP560	SP520 Plus	A07RZ	A07
Case dimensions (in.)	1.83x1.58x1	1.5x1.75x0.75	1.75x1.5x1	1.85x1.60x0.85	1.07x0.5x1.3	1.07x0.5x1.3	1.5x1.75x0.75	1.5x1.75x0.75	1.21x1.03x0.7	1.21x1.03x0.7
Cells	6 & 7	5-7	6 & 7	4-10	6-7	6-7	5-7	5-7	6	6
On resistance (ohm)	0.0075 x2	0.0125	0.010	0.007	0.0035	0.010	0.009	0.012	0.003	0.003
Frequency (Hz)	60	NA	60	1000	1500	1500	NA	NA	2930	2930
BEC (volts/amps)	6/NA	5.6/NA	5.8/2	-	6V	6V	6/5	6/5	5.8/1	5.8/1
Motor limit	Stock	Stock	13 turn	12 turn	13 turn	20 turn	16 turn	Stock	None	None
Overload protection	Thermal	Fuse	Fuse	Thermal	Thermal	Thermal	Thermal	Thermal	Thermal	Thermal
Battery plug	Tamiya type	Tamiya type	Tamiya type	Tamiya	Tamiya	Tamiya	Tamiya type	Tamiya type	Tamiya	Tamiya
Receiver plug	Airtronics	Futaba	Futaba	Universal	Futaba	Futaba	Universal	Universal	Universal	Universal
Motor plugs	Bullet	Bullet	Bullet	Bullet	Bullet	Bullet	Bullet	Bullet	Bullet	Bullet
Current limiter	None	None	None	None	None	None	None	None	Yes	None
Reverse disable	No	No	No	No	Yes	Yes	No	No	Yes	Yes
Warranty (days)	90	120	120	120	90	90	1 year	1 year	90	90
Proportional brake	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Proportional reverse	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Push-button setup	No	No	No	Yes	Yes	Yes	No	No	Yes	Yes
Street Price**	\$70	\$50	\$65	\$65	\$75	\$55	\$70	\$55	\$140	\$120

*Transistor and diode rating at 25°C junction temperature. **Approximate; price varies with dealer.

- Removable servo-type mounting lugs.
- Tamiya battery plug and bullet connectors for drop-in replacement of MSC.

KEYENCE

These Keyence controllers pack a ton of electronics into their tiny translucent cases, and both have useful features, for example, easy-to-adjust reverse delay (0.5 second to 3 seconds, with the option of "infinite delay"); in other words, no reverse—only brake (just what you need for racing). The RZ model adds a current limiter with Dash Power mode for full-power starts and a Battery Save mode for extended run times. Otherwise, the units are identical with super-fast 2930Hz switching for smooth throttle action.

A07

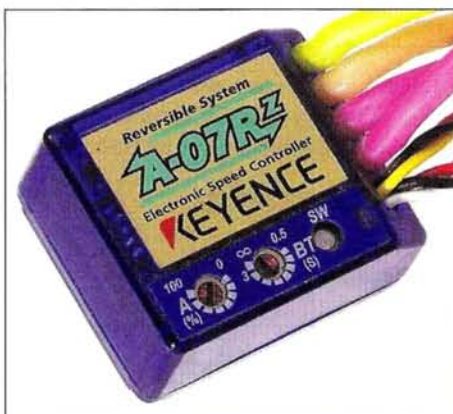
- Brake-timer function allows reverse delay to be set from 0.5 second to 3 seconds to "infinity"—no reverse; just proportional brake.



- Stick-on aluminum heat sink replaces faceplate if required.
- Extra-small.
- Tamiya battery plug and bullet connectors for drop-in replacement of an MSC.

A07RZ

- Includes adjustable current limiter and Brake Timer function.
- Dash Mode disables current limiter for a full-power start and then reactivates the limiter after the first burst of throttle.
- Stick-on aluminum heat sink replaces faceplate if required.
- Tamiya battery plug and bullet connectors for drop-in replacement of an MSC.



KO PROPO

These KO controllers join the Keyence and Futaba ESCs as the smallest of the small. The 1100 is the top-of-the-line model; it includes a stick-on heat sink, reverse-disable capability and a couple of unique functions. Forward Punch allows you to alter minimum throttle and can be set at from 0 to 20 percent. For example, if you set the Forward Punch for 20 percent, the ESC will send 20 percent of full throttle to the motor the instant you move the trigger from neutral; this makes the motor feel more punchy, hence its name. Brake Punch does the same on the brake side. Both KSC models have push-button on/off switches (cool) and "double pump" reverse activation to protect your tranny gears. The first application of up-trigger is all brake; after you've returned the trigger to neutral, the next up-trigger activates proportional reverse.



KO Propo		LRP				Novak			Traxxas	
KSC1100FR	KSC1000FR	F1 Pro Reverse	F1 Super Reverse	F1 Reverse	Runner	Super Rooster	Rooster	Reactor	Vx12	XL-1
1.28x1.28x0.69	1.28x1.28x0.69	1.56x1.56x0.56	1.56x1.56x0.56	1.56x1.56x0.56	1.56x1.56x0.56	1.63x2.02x1.22	1.63x2.02x1.22	1.63x1.42x0.69	1.87x1.58x1.33	2.38x1.54x1.58
6-7	6-7	4-7	4-7	4-7	4-7	6-10	6 & 7	6-7	12	6-7
NA	NA	0.0045	0.009	0.017	0.026	0.002*	0.018*	0.004	0.006	DNA
1800	1800	2500	2300	2100	1250	1250	1250	1000	60Hz	60Hz
6/2	6/2	5/1.6	5/1.6	5/1.6	5/1.6	6/3	5.7/0.5	5/0.5	5.6/0.5	5.2v
10 turn	15 turn	None	12 turn	16 turn	20 turn	None	15 turn	12 turn	None	Stock
Thermal	Thermal	Yes	Yes	Yes	Yes	Dual-level thermal	Dual-level thermal	Thermal	None	None
Tamiya	Tamiya	Tamiya type	Tamiya type	Tamiya type	Tamiya type	None	Tamiya type	Tamiya	Tamiya	Tamiya
Futaba	Futaba	Universal	Universal	Universal	Universal	Universal	Universal	Universal	Futaba	Futaba
Bullet	Bullet	Bullet	Bullet	Bullet	Bullet	None	Bullet	Bullet	Bullet	Bullet
None	None	Yes	Yes	No	No	No	No	No	No	No
No	No	No	No	No	No	Yes	Yes	Yes	No	No
90 days	90 days	90 days	90 days	90 days	90 days	120 days	120 days	120	30	30
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
\$100	\$85	\$120	\$95	\$70	\$60	\$130	\$80	\$95	\$95	\$45

KSC1000FR

- Push-button power switch.
- Brake operation is fully independent of reverse.
- Tamiya battery plug and bullet connectors for drop-in replacement of an MSC.

KSC1100FR

- Push-button power switch.
- Forward Punch and Brake Punch settings for more aggressive braking and quicker starts.
- Reverse may be disabled for racing.
- Stick-on heat sink replaces faceplate if required.
- Brake operation is fully independent of reverse.
- Tamiya battery plug and bullet connectors for drop-in replacement of MSC.

LRP

LRP's full line of reversing ESCs is long on features. All have push-button setup and factory-installed connectors for ease of installation. The Pro has the most going on: an adjustable current limiter that won't reduce top speed no matter how low you set it, Intelligent Brake Control circuitry that prevents reverse from kicking in until the motor has stopped, and the highest frequency of the LRP controllers (2500Hz). The F1 Super, F1 Reverse and Runner operate at increasingly lower frequencies and have simplified features as you move down the line; check out the points below.

F1 PRO REVERSE

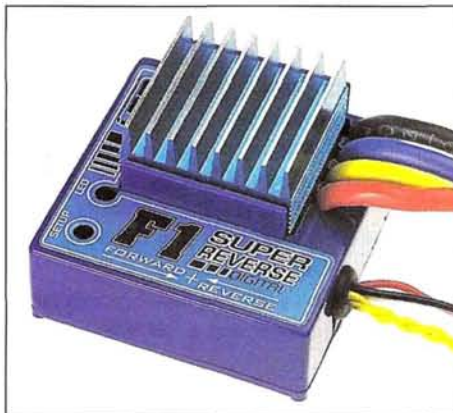
- Adjustable Power Control (APC) current limiter reduces wheelspin in slippery conditions without limiting top speed.



- To protect transmission parts, Intelligent Brake Control (IBC) engages reverse only after the motor has stopped.
- High-frequency 2500Hz operation.
- No motor limit.

F1 SUPER REVERSE

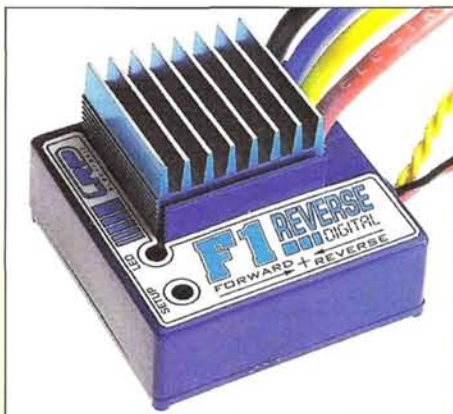
- Features the same APC and IBC circuitry as the Pro model.
- High-frequency 2300Hz operation.



- Handles mod motors down to 12 turns.
- Tamiya battery plug and bullet connectors for drop-in replacement of an MSC.

F1 REVERSE

- Features IBC circuitry.
- High-frequency 2100Hz operation.



- Handles mod motors down to 16 turns.
- Tamiya battery plug and bullet connectors for drop-in replacement of MSC.

RUNNER PLUS

- Inexpensive ESC for use with stock and very mild mod motors.



- Push-button setup.
- First 50 percent of up-trigger is proportional brake; the remaining throw is proportional reverse.
- Tamiya battery plug and bullet connectors for drop-in replacement of MSC.

NOVAK

Novak made a big splash with its original Rooster, and the Super Rooster has become the unofficial favorite ESC among dual-motor monster-truck fans. It's easy to see why: it has no motor limit, even when you run a pair of motors. It's also tough and cool-running thanks to its Polar Drive circuitry and dual-level thermal-overload protection. Monster truck guys usually run high-power servos, so the Super Rooster's 3A, 6V BEC is also a welcome feature.

SUPER ROOSTER

- No motor limit, even in dual-motor applications.
- Smart Braking activates reverse only after the motor has slowed to a safe speed.
- Polar Drive circuitry for maximum efficiency and cool operation.
- Heavy-duty, 3A, 6V BEC handles high-power servos.
- Radio priority circuitry maintains full servo power as the battery power is depleted.



- Reverse-Disable circuitry locks out reverse for racing.
- Connectors for motor and battery are not included.

ROOSTER

- Includes best Super Rooster features: Polar Drive, Smart Braking, Radio Priority, Reverse-Disable circuitry.
- Handles mod motors down to 15 turns.
- One-touch push-button setup.
- Tamiya battery plug and bullet connectors for drop-in replacement of an MSC.



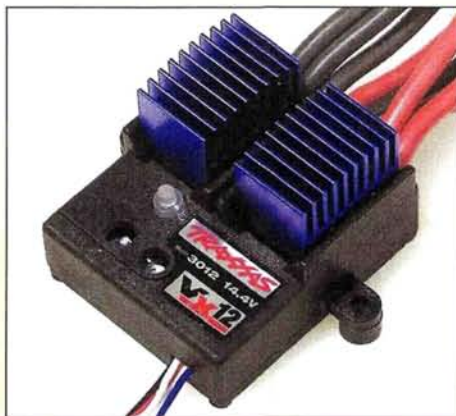
TRAXXAS

The XL-1 has been around forever and still "throttles" Traxxas' ESC-equipped RTR cars and trucks—except for the E-Maxx, which sports the new 12-cell Vx12 unit. The XL-1 has servo-style mounting tabs, big ol' bolt-on heat sinks, installed motor and battery plugs and robust construction. Its best feature is its low price, but after you've forgotten what you paid, you'll probably be most happy with its reliability.

The Vx12 is another story. It was designed from the ground up to handle dual motors and 12 cells (two stick packs) in series; that's 14.4 volts. Though it was custom-built for the E-Maxx, there's nothing to stop you from using the Vx12 in a Tamiya Clod Buster, Wild Dagger, or Juggernaut, a Kyosho USA-1, or a custom dual-motor, big-volt project.

VX12

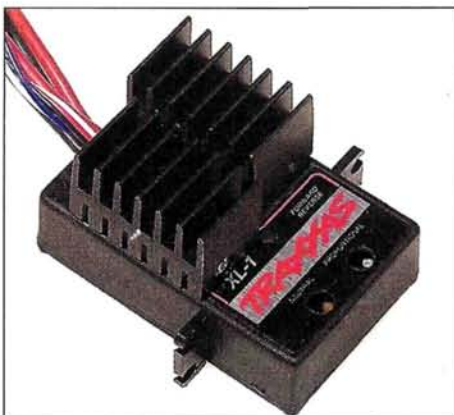
- Manual setup with LED indicators.
- Very low price.
- Large, bolt-on heat sinks.



- Original equipment for Traxxas RTRs with ESCs.
- Tamiya battery plug and bullet connectors for drop-in replacement of MSC.

XL-1

- Original ESC for the Traxxas E-Maxx.
- Manual setup with LED indicators.
- Large anodized heat sinks.



- Designed for use with dual motors (wired in parallel) and 12 cells (wired in series).
- Tamiya battery plug and bullet connectors for drop-in replacement of MSC. ■



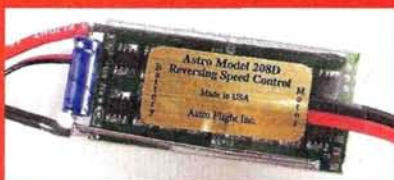
REACTOR

- Includes the best Rooster-series features: Polar Drive, Smart Braking, Radio Priority, Reverse-Disable circuitry.
- One-touch push-button setup.
- Handles mod motors down to 12 turns.
- Tamiya battery plug and bullet connectors for drop-in replacement of an MSC.

You want to run how many packs?

AstroFlight 208D Speed Control

During the last 30 years—basically the entire history of electric RC—AstroFlight has cultivated a reputation for its no-nonsense, performance-first electronics. With its caseless, shrink-wrapped design, the 208D controller is all business and is meant for high-power applications. It can handle 30 amps of continuous current with a maximum voltage of 24 volts; that's 20 cells—even more voltage than three stick packs combined. That kind of power would quickly melt a Tamiya-style connector, so AstroFlight supplies its own excellent zero-loss connectors for the battery and motor. The 208D has fully proportional forward and reverse only (no brake); it features high-frequency (2800Hz) operation for a smooth throttle feel, has preprogrammed neutral/forward/reverse settings, and is protected against overload. With no motor limit and a big power capacity, the 208D is recommended for speed freaks and high-power monster truck fans.



SPECIFICATIONS

Dimensions: 2.6x1.6x0.5 in.
Cells: 4 to 20
On resistance: 0.0025 ohm
Frequency: 2800Hz
BEC (volts/amps): 5/1.5

Motor limit: None
Overload protection: Yes
Battery plug: Astro Zero Loss
Receiver plug: Universal
Motor plug: Astro Zero Loss

Reverse-disable: No
Warranty: 90 days
Proportional brake: No
Proportional reverse: Yes
Est. street price: \$130

SOURCE GUIDE

AIRTRONICS

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ASTROFLIGHT

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Germany; 1149-7181-4098-0;
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NOVAK ELECTRONICS INC.

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833-8873; www.teamnovak.com

Panasonic 3000 Stock Metal-Hydride

Trinity's high-zap hydrides
—all the run time with
the voltage of a Ni-Cd by Steve Pond



In early 1999, new technology was introduced for the top-level batteries that power the vast majority of electric-powered RC vehicles; it was the nickel-metal-hydride (NiMH) 3000mAh cell. These new cells brought a wholesale increase in power the likes of which had never been seen in the electric market, and they soon became known for being distinctly different from the older 2000 (and later, 2400) Ni-Cds.

The key difference that most racers recognized between first-generation NiMH cells and Ni-Cds was that the NiMH cells have a lower voltage. Their marginally lower nominal voltage was enough of a difference to make racers think the new cells were a little "soft" and would lack the punch and speed of Ni-Cds.

Panasonic now offers a second-generation cell: the 3000 Stock Metal-Hydride (SMH), first displayed at the 2000 Chicago Model Show, and it should already be in hobby shops. The new cell is engineered to ensure a lower internal resistance that provides more punch and higher voltage for top speeds, and it rivals the power of the 2000 and 2400mAh Ni-Cd packs.

Why call the new cells "Stock Metal-Hydride"? Stock-class racers were especially adamant that the first-generation NiMH cells actually decreased performance. Lower battery voltage—combined with the motor limit imposed in stock-class racing—is generally thought to compromise performance. The new SMH cells were designed specifically to address these concerns.

The new cells' configuration is identical to that of the original crop. Because their dimensions and weight are the same, there shouldn't be any concerns about fitting a particular chassis that has battery slots that are tight around the

cells; in fact, the only visible difference between the first and second-generation cells is the unique design of the new cells' shrink-wrap.

TESTING

As we do for all of our *RC Car Action* battery tests, I tested our sample cells in the industry-standard Competition Electronics Turbo Matcher 4. The parameters were set to the current standard for cycling NiMH batteries: 4A charge rate, 0.02V peak detection, 20 and 30A discharge rate and 0.85V-per-cell discharge cutoff. That's a lot of mumbo-jumbo to tell you we used the same machine and testing parameters as most major battery-matching companies do.

COLD CYCLE

Cold cycles are run after the batteries have had time to rest—from at least a day to up to four days between cycles. Conventional wisdom suggests that batteries usually perform better after a suitable rest. Although Sanyo and Panasonic first-generation batteries proved to be anything but conventional, allowing the batteries to rest between cycles provides a basis of comparison for later, more aggressive cycles. Figure 1 shows the results for 20 and 30A discharge rates.

FIGURE 1. TEST CELL RESULTS

Discharge rate (amps)	Run time (sec.)	Volts per cell	mAh	Milliwatt /hours	Internal resistance (milliohms)
20	525.5	1.171	2903	3393.25	15
30	355.5	1.124	2895.5	3328.75	21

These numbers show a somewhat higher voltage than can be achieved with 2000 or 2400mAh Ni-Cds and first-generation NiMH cells. These are excellent numbers by any standard and are certainly well-suited to the stock-racing class for which the new NiMHs were originally developed.

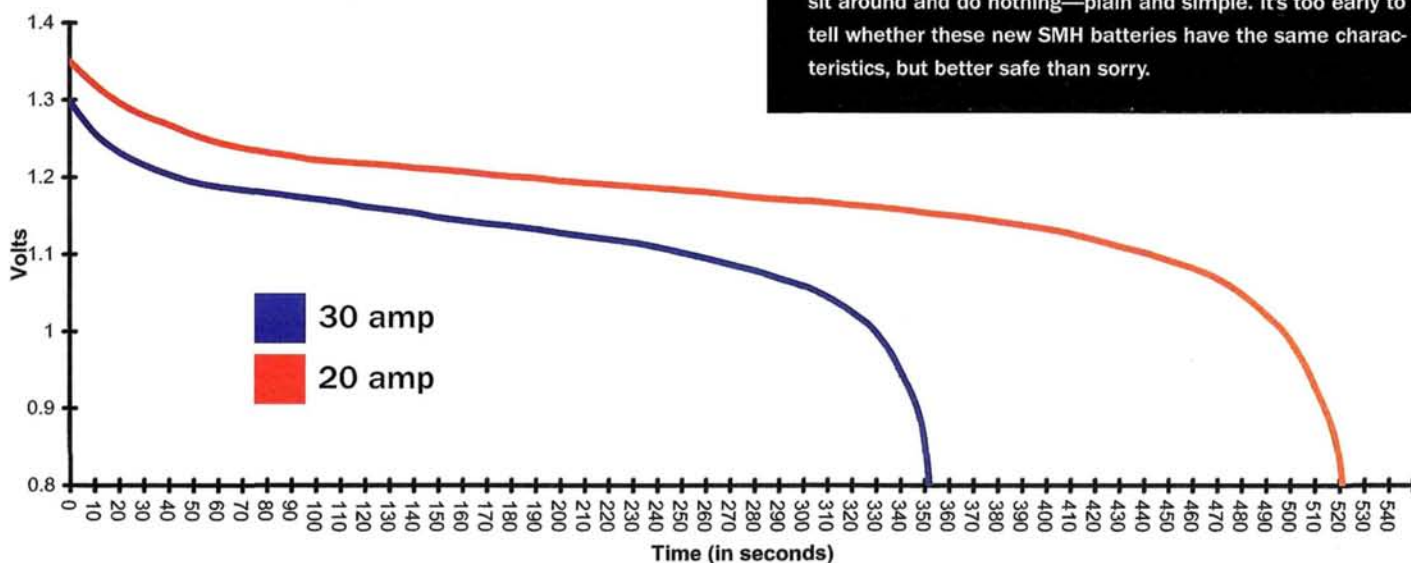
RAPID CYCLE

Rapid, or "hot," cycling means that the cells are cycled in rapid succession and given just enough time between cycles to cool to room temperature. This provides data on the cells' ability to handle repeated use within a short time—a practice previously frowned on by old-school battery gurus. At a 30A discharge rate, the new SMH cells lost an average of 6.25 seconds of run time. The voltage, however, increased to an average of 1.128—up from 1.124 volts during the cold cycling.

A 20A discharge rate during rapid cycling had a similar effect on the cells. Average run time dropped approximately 10 seconds through the second cycle, and average voltage climbed to 1.176 per cell. There's a slight shift in voltage and run time but nothing of real consequence. Rapid cycling actually appears to offer a very slight benefit for stock-class racers because there's a very small increase in voltage. The marginal loss of run time is insignificant in stock-class racing because these batteries have more capacity than is generally needed to complete a race.

The changes in the performance figures during subsequent cycles were greatest during the second cycle: the nominal voltage increase and drop in run time were most significant then. This effect, however, tended to level off in later cycles. Would

it was a mistake to call these cells "Stock Metal-Hydride" because some might think they can't be used for modified racing. Nothing could be further from the truth. These cells were certainly engineered for higher voltage, and that makes them ideal for stock-class racing and—despite their name!—for modified racing, too.



NiMH charge, discharge and maintenance tips for racers

NiMH packs require a slightly different maintenance routine than Ni-Cds. The differences are subtle, but following the proper charge and discharge procedures can help ensure solid, long-term performance.

Charge your pack the night before the race. This helps you get on the track more quickly for practice, and you'll only need to peak-charge them before running on the following day.

Charge at a maximum rate of 4 amps. Use a charger that is specifically for NiMHs or one that can be adjusted to 0.02V peak detection. Team racers will confess to charging at up to 5 amps for better voltage, but it's better to stick with 4 amps to protect your investment.

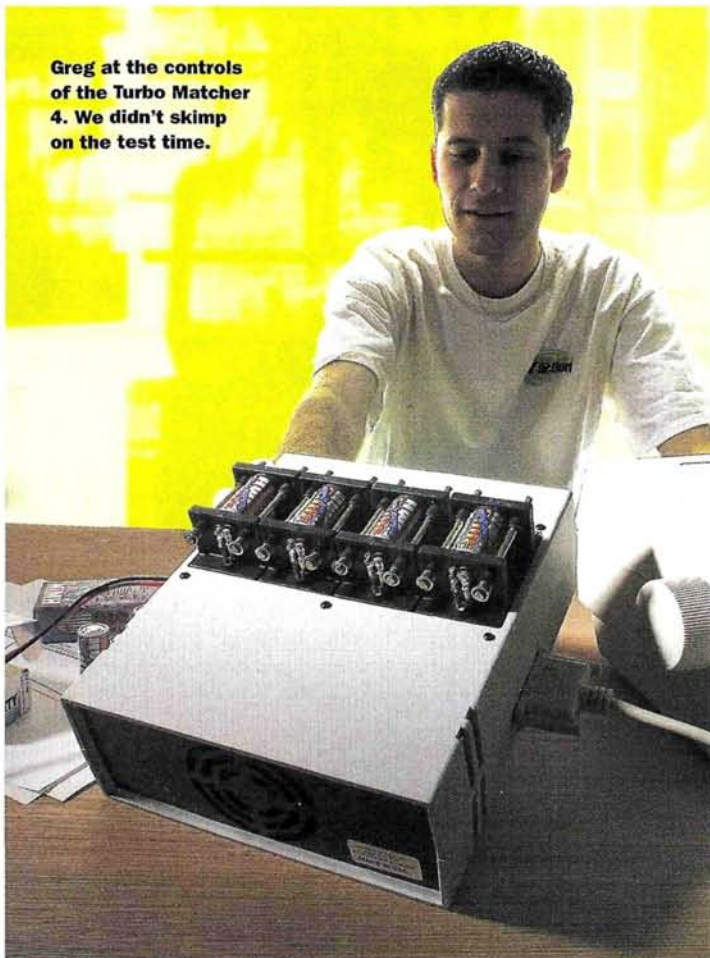
Run each pack once in practice before you recharge it for the qualifiers and Mains. These packs actually run a little better in stock class if they're on their second cycle; voltage is a little better, and there's still plenty of run time.

Don't discharge your pack after each run. NiMH cells don't have the strong memory characteristics of Ni-Cds, so you don't have to wipe out the residual charge after every run. Let the pack cool, then, once it has completely cooled to room temperature, simply hook it up for the next cycle.

Store the pack with at least a 50-percent charge. It's OK to discharge the pack to determine the remaining run time, but put at least half a charge back into it. The first-generation NiMHs are use-it-or-lose-it cells; they shouldn't be left around for long periods (over a month) without being used or charged. It's a good idea to "exercise" your packs by cycling them about once a month. They don't like to sit around and do nothing—plain and simple. It's too early to tell whether these new SMH batteries have the same characteristics, but better safe than sorry.

a single pack last a whole day at the races? Sure it would. Even though it would be better to have a second pack to give the pack a break between rounds, I wouldn't hesitate to run these new packs two or three times in one day.

Greg at the controls of the Turbo Matcher 4. We didn't skimp on the test time.



How good are they?

Voltage. The average voltage levels were great; in fact, I hadn't before tested a NiMH pack with this equipment and produced this kind of voltage. Although the voltage level of the newer date codes (later production) of 2400 Ni-Cd batteries is very close to that of the Stock Metal-Hydride packs, these NiMH packs' voltages slightly exceed those of the better Ni-Cds—pretty impressive.

Run time. The SMH cells register more than 350 seconds of run time at 30 amps and upwards of 520 seconds at a 20A rate. This is slightly lower (by about 20 seconds) than the best first-generation NiMHs, but these older cells tended to lose about 20 seconds of run time anyway after a few weeks of racing.

Charging frequency. Repeatedly charging SMH cells doesn't appear to negatively impact performance, and that dispels the old-school idea that you can use a pack only once a day. These cells don't appear to mind being cycled many times a day, as long as they're given a chance to cool between cycles.

Internal resistance. The SMH cells have considerably lower internal resistance than the first-generation NiMHs. The original Panasonics measured about 27 to 28 milliohms; the SMH cells that I tested measured 21 milliohms. Their lower internal resistance may be the primary reason for the higher voltage, but it also kept the cells slightly cooler during charging and discharging.

Late-breaking news

Just before going to press, I received a few packs of production cells from Trinity. Although I had a chance to test them with only two quick cycles, they appear to perform better than our engineering samples. Here are the averages for two cycles of 18 production cells.

FIGURE 2. PRODUCTION CELL RESULTS

Discharge rate (amps)	Run time (sec.)	Volts per cell	Internal resistance (milliohms)
20	547.9	1.174	14
30	364.6	1.131	18

I was sent four engineering samples of the SMH cells to test, so my results might be different from those of the batteries ultimately sold in hobby shops. History has shown that production cells may or may not match the preproduction characteristics; so long-term results might be different, and I don't have enough time to establish this.

Even though tests must be continued to evaluate their long-term performance, I think it's safe to say that the SMH cells represent a significant improvement in the usability and range of NiMH cells.

I think it was a mistake to call these cells "Stock Metal-Hydride" because some might think they can't be used for modified racing. Nothing could be further from the truth. These cells were certainly

engineered for higher voltage, and that makes them ideal for stock-class racing and—despite their name!—for modified racing, too. Their lower resistance keeps them a little cooler and provides better punch. They should allow the use of motors with a slightly higher number of turns and should make it a little easier on the electronics. If you run a modified motor, there's no need to stay away from these cells. ■

SOURCE GUIDE

TRINITY PRODUCTS INC.
36 Meridian Rd., Edison, NJ
08820; (732) 635-1600;
www.teamtrinity.com.

COMPETITION ELECTRONICS
3469 Precision Dr., Rockford, IL
61109; (815) 874-8001.

Hara wins ISTC World Cup; LRP sweeps A-main

The ISTC World Cup 2000 was held in China December 5 to 9, 2000. IFMAR World Champion Atsushi Hara took down the win with his new Daytona ride. Interesting to note that Hara is again running for LRP and used a Quantum Competition speedo in his car. Even more interesting, the top four drivers used Quantum Competition

TOP 10 ISTC WORLD CUP 2000

POSITION	DRIVER	COUNTRY	CAR
1	Atsushi Hara	Japan	Speedmind
2	Craig Drescher	Britain	Associated
3	Yukijiro Umino	Japan	Speedmind
4	David Spashett	Britain	Yokomo
5	Mike Swauger	USA	Xpress
6	Yuming Qin	China	Speedmind
7	Mio Hakamata	Japan	HPI
8	Zijian Hu	China	Speedmind
9	Zhiyuan He	China	Speedmind
10	Zhian Liu	China	Speedmind

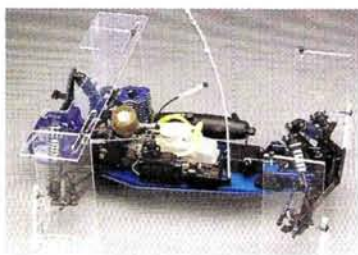


speedos, while the rest used LRP V7.1s. Congratulations to Hara for the win and to LRP on its ISTC World Cup main event sweep.



SEXY CIVIC

You've seen Team Losi Manager Richard Trujillo's Civic in the mag before, but it's such a pretty car, we just had to show you another picture. Especially this one! It was taken at the Import Showoff Classic at the Anaheim Convention Center in Anaheim, CA. Rich took first place in the Honda Class.



HUDY SETUP SYSTEMS

Hudy is a company well-known for its precision tools and measuring devices. Soon the company will add setup systems for 1/10 off-road trucks and the popular E-Maxx and T-Maxx. The setup system is a series of plates that are bolted in to allow you to set camber and toe accurately.

World Champ leaves Yokomo

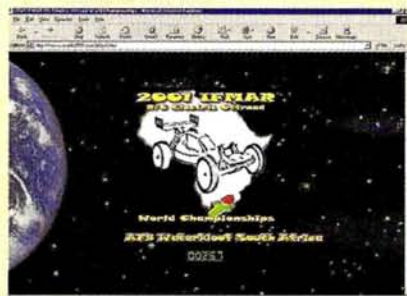
Atsushi Hara has left Yokomo after taking the World Championship touring car title. Hara now is driving for HPI. Hara will be using his skills to pilot the new Pro 3. Hara has also switched to LRP ESCs; he used a GM controller when he won the IFMAR ISTC Worlds title in Japan last September.

Who's racing for whom?

A number of drivers have left their factory rides for new sponsors. Here's the latest on who's driving for whom, but don't consider this list final; someone is always looking for a bigger, better deal.

DRIVER	LEFT	JOINED
Travis Amezcua	Losi	Team Associated
Dave Lofton	Yokomo	Losi
Andy Smolnick	Team Associated	Kyosho
Gene Hickerson	Losi	Kyosho

SITE SEEING



[WWW.RCWORLD2001.COM](http://www.rcworlds2001.com)

The 2001 Off-road Worlds is rapidly approaching. The official website is up and running and is a great place to get information about the race. The site will have webcam views of that race and potentially of the warmup race that will be held in May. Check out what South Africa has to offer the Worlds' finest drivers as they do battle inside an Air Force hangar.

sponsored by

KYOSHO
THE FINEST RADIO CONTROL MODELS

SPEED SHOP

Yokomo GT-4W upgrades

These new GT-4W parts are machined-aluminum and have been left their natural silver. Yokomo currently offers aluminum radio-plate posts for both left and right sides. A rear bulkhead support with bearings replaces the composite unit, and a side belt tensioner (also with bearings) is available. There are steel universals for smoother suspension and better front traction, along with aluminum clamping hubs that prevent lost roll pins and hexes if a wheel comes off. A full line of tuning springs gets you dialed into any track.

Aluminum radio-plate post (L/R)—ZE-116PLA/ZE-116PRA, \$13.75.

Aluminum rear-bulkhead support—ZE-300RSA, \$16.75.

Side belt tensioner—ZE-BTS, \$22.25.

Front universal drive shaft—ZE-010FS, \$26.25.

Aluminum clamp hub—ZE-011C, \$10/pair.

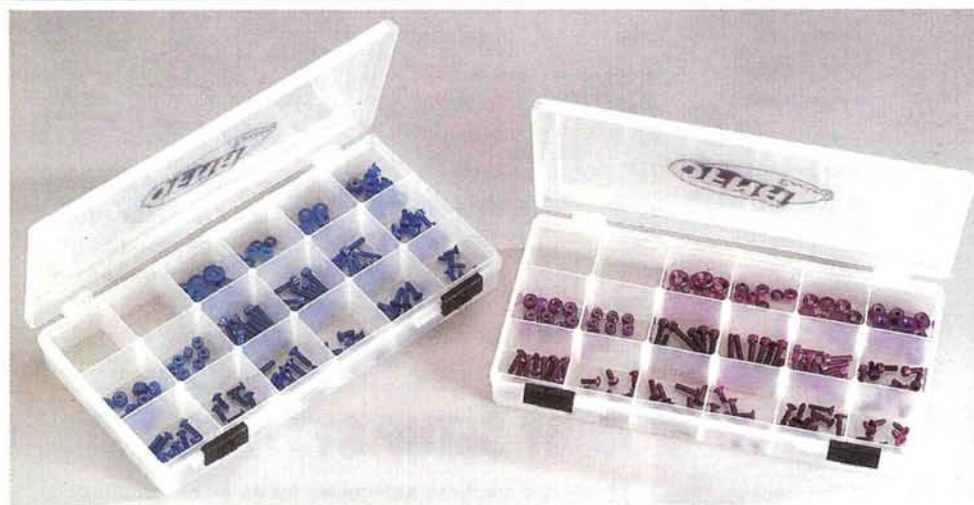
Pro shock springs—various, \$5.25.



HPI bumper plate

A common problem with foam bumpers is that, after a couple of hits, the foam bends up and the body posts begin to tear through it. HPI has recognized and addressed this problem with the release of a carbon-fiber bumper plate. The plate sits on top of the bumper and is retained by two body clips fastened in the posts. The plate's large surface prevents the bumper from bending upwards; it's a definite must-have if you're a hack.

Bumper plate—6272, \$8.



OFNA 7075 alloy hardware assortment

Check out these hardware assortment packs; each compartment contains 10 fasteners or washers in a variety of metric sizes. The hardware is a 7075 aluminum alloy, so they are strong, light and anodized in bright blue or purple. The sturdy box is an added bonus and features locking latches so you won't spill your fancy new screws inside your pit bag.

Hardware assortment (blue/purple)—10950/10951; \$59.95.



Mugen Seiki MT12 engine

If you're a racer, you've probably heard about the potent Mugen Seiki MT12 engine. Many racers are using this popular rear-exhaust mill in their 1/10 on- and off-road vehicles. Mugen's newest edition of the MT12 is a turbo-plug version. It's available with or without an SG shaft and still includes the 3-needle carburetor. If you want speed, you're going to want this engine.

MT12 Turbo—MT12T, \$259.99.



GS Racing split-spoke 1/8 wheels

These attractive rims fit most 1/8-scale buggies. The split 5-spoke design looks great, and the rims are very stiff and don't flex much. They were designed specifically for the 2000 Worlds and should be available by the time you read this.

Call for information.



sponsored by
KYOSHO
THE FINEST RADIO CONTROL MODELS

SPEED SHOP

Hardcore titanium for OFNA Nitro-OB4

Hardcore's 3.1mm OB4 chassis is countersunk and slotted for reduced weight. The flywheel opening is 50 percent larger for increased clearance and starting-wheel access. Hardcore also offers pulley shafts for single- and 2-speed transmissions. All parts are available in blue, green, purple, or silver.

Nitro-OB4 titanium chassis—HCR-00700, \$135.

OB4 titanium pulley shaft—HCR-00706 (2-speed), \$45; HCR-00707 (single-speed), \$40.



Takeoff setup wheels

These purple aluminum setup wheels feature large openings that allow easy-access suspension balls—great for all you Serpent, Mugen and OB4 guys. The wheels allow for more accurate toe and camber settings by giving your camber gauge (not included) a solid base from which to measure without the inconsistency of a tire sidewall (as encountered when measuring camber directly from your car's rim and tire).

Setup wheels—part no. T0332B (blue), T0332P (purple); \$29.99.



JR Z8550 digital racing servo

Digital servos are popular in racing and heavy-duty applications because they supply increased torque, holding power and centering. JR's new Z8550 digital servo provides 188 oz.-in. of torque and a transit speed of 0.15 sec./60 degrees at 6 volts.

JR Z8550 digital servo—JRPSZ8550, \$114.95.



Your **SOURCE** for
the latest in
trackside style.



Pro-Line racing T-shirt
Part nos. 9947-03, -04, -05
(L, XL, XXL); \$18, \$18, \$20.



5 QUESTIONS

by Stephen Bess

Age: 18

Best finish: 9th at the 2000 1/8 Off-Road IFMAR Worlds

Favorite track: former Ranch Pit Shop track

Sponsors: Kyosho, Pro-Line, O.S. Engines, Progressive Suspension, O'Donnell Racing, Lunsford Racing, Nuova Faor, FTD, Brick Bodies

When I'm not racing:

I'm a freshman at the University of Nevada/Las Vegas

Radio Control Car Action: You're into motocross. Which bike do you ride, and who's your favorite motocross rider? Has it helped your RC driving?

Jason Ashton: To me, motocross is the most exciting sport there is; I've raced supercross for as long as I can remember. I'll admit that I'm not that great because I don't want to get hurt, but I go out and "play ride." I'm more of a fan than a racer. I think riding has helped my RC career with timing the jumps and knowing throttle control because they're so similar. A lot of people who run motocross also run RC. My favorite rider right now is Doug Henry because he has had so much heart, to come back from two devastating injuries.

RCRA: What is your most memorable RC race?

JA: My first Silver State race at the old motocross track in Vegas. It was my first 1/8-scale race, and a good friend who's a mechanic didn't have a driver, so I raced for him without sponsors. I ended up TQ'ing my first-ever 1/8-scale race against guys like Mark Pavidis and Richard Saxton. I gained a lot of confidence after that race.

RCRA: You raced the 2000 IFMAR 1/8 Off-road Worlds and attended college classes during the same week; how did you manage to do both?

JA: It was insane. Once racing started and the heats were switched, it was all up to my mechanic. At one point, I asked him to page me in class when my heat came up; when I called him, he told me I was up in 10 minutes! As soon as I got there, my car was running and warmed up, ready to go. My heat was up in 2 minutes, and I hit the track.

RCRA: Where does RC car racing fall in your list of priorities?

JA: RC is pretty low. There was a while when I thought I should move it up a bit, but grades went down. I quit electric and began racing only gas, and now I race only 1/8 scale. The top of my list is school, my girlfriend and my parents. RC is down there. When it comes down to it, we're just racing toy cars. I just want go out there and have fun.

RCRA: Who has been the biggest influence in your RC career?

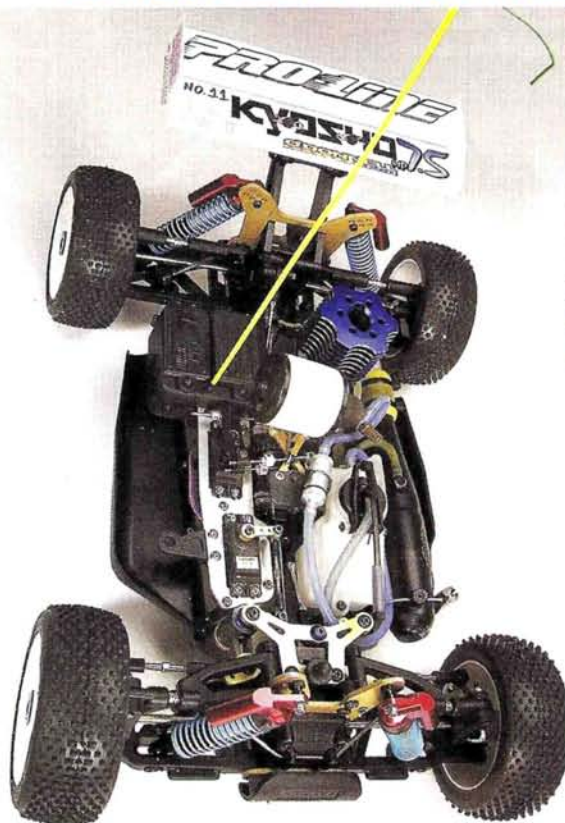
JA: Besides my dad, I'd have to say Pops Losi. He was the first person to sponsor me when I was ten years old. I want to thank Pops for everything he did for me; I wouldn't be where I am now without him.



Jason Ashton

UNDER THE HOOD

JASON ASHTON'S **KYOSHO MP 7.5 KANAI EDITION** SETUP FOR THE IFMAR WORLDS



FACTORY OPTIONS

Jason didn't use any additional option parts on his car for the IFMAR Worlds, since the Kanai Edition already includes them.

SETUP

	FRONT	REAR
Shocks		
—type	ML	Normal
—piston	1.3x2	1.3x2
—oil	Associated 40WT	Associated 25WT
—spring	Blue	Blue
Spacer	8mm	3mm
Shock Stay	Upper inside	Lower middle
Suspension arm	In	In
Rebound	98mm	114mm
Camber	-2°	-2°
Toe-in	1°	2°
Swaybar	2.5mm	2.8mm
Suspension holder	—	2°
Suspension plate	—	2° (gold)
Hub position	—	Upper
Shock stay/wheel side	4	Outer
Wheelbase	—	Front side 5mm
Caster	Upper B, under B	—
Steering plate	B	—
Wing angle	—	Under
Diff oil		
—front	5,000WT	
—center	10,000WT	
—rear	1,000WT	



We'd love to tell you about a bunch of modifications Jason made to his car to make the A-main, but there weren't any. The front is a stock MP 7.5 Kanai Edition buggy with the exception of the Progressive Suspension reservoirs that Jason added after the Worlds.



It's all stock; however, this shot shows you the shocks and camber links Jason mounted for the harsh Las Vegas track.

MODIFICATIONS

The buggy was run bone-stock at the Worlds; however, since then, we've noticed that Jason has added Progressive Suspension reservoirs.

EQUIPMENT

RADIO: Airtronics M8
SERVOs: (throttle/steering) Airtronics 94737/94358
WHEELS: Pro-Line Velocity
ENGINE: O.S. RZV99b
FUEL: O'Donnell 30 percent
PLUG: O.S. no. 8
TIRES: Pro-Line Crime Fighters
INSERTS: Pro-Line
PIPE: Omega 069
SPUR: 46T
CLUTCH BELL: 13T
CLUTCH SHOE/SPRING: 3-piece/M



HOT MOD HOW TO

FOUR SUSPENSION FREE-UPS

Suspension binding is a common problem for both new and used cars. During a race, it can make the car spin out or become unstable over bumpy sections. The easiest way to check for binding is to remove the shock, then lift and drop the suspension arm. If the arm drops with no sign of friction, your car is ready for action. If your suspension binds, here are some tips to help you free it.

■ STEP 1. Reamers are available at most tool and hobby shops and are the best way to remove excess plastic from a new suspension arm that binds. You can also use one to clean grit and grime out of older arms so they drop freely again. To clean the hole out, simply push the reamer through the arm with a twisting motion.



■ STEP 2. The coating on new ball studs and grime are both sources of binding. To remove imperfections, simply spread some toothpaste—not “gel”—on a rag; then chock the ball stud into a Dremel tool. Spin it slowly, and apply slight pressure to the rag; the toothpaste will polish the ball stud.

■ STEP 3. Overtightening the nut that retains the top of the shock can crush the plastic shock bushing and cause it to bind. Only snug the nut to the shock bushing when you tighten it.



■ STEP 4.

The ball cup and ball at the bottom of the shock can bind, since many are plastic-on-plastic applications. Dirt between these parts can also cause binding. An easy way to free them is to leave a small gap about the size of one screw-thread when you tighten



the screw that holds the shock to the arm. This allows the ball to pivot on the screw.

Dirt and grime can build up quickly, so check your suspension often—especially before a main race event. It could mean the difference between being a hero or a zero.

SOURCE GUIDE

AIRTRONICS
1185 Stanford Ct.,
Anaheim, CA 92805; (714)
978-1895;
www.airtronics.net.

ASSOCIATED ELECTRICS
3585 Cadillac Ave., Costa
Mesa, CA 92626-1403;
(714) 850-9342;
www.rc10.com;
www.teamassociated.com.

GS RACING
650 W. Duarte Rd., Ste. 205,
Arcadia, CA 91007; (626)
445-6036;
www.gsweb.com.tw;
gsusa82@aol.com.

**HARDCORE RACING
COMPONENTS**
25435 Rye Canyon Rd.,
Valencia, CA 91355; (661)
294-5032.

HPI RACING
15321 Barranca Pk., Irvine,
CA 92618; (949) 753-1099;
www.hpiracing.com.

JR RACING
4105 Fieldstone Rd.,
Champaign, IL 61821; (217)
355-9511.

KYOSHO
distributed by Great Planes
Model Distributors
P.O. Box 9021, Champaign,
IL 61826-9021;
(800) 682-8948.

MUGEN USA
20914 Blake Pk., Ste. 106,
Lake Forest, CA 92630;
(949) 707-5607.

O'DONNELL RACING
10702 Hathaway Dr., #2,
Santa Fe Springs, CA
90670; (562) 944-9671.

O.S.
distributed by Great Planes.

OFNA RACING
22692 Granite Way, Ste. B,
Laguna Hills, CA 92653;
(949) 586-2910;
www.ofna.com.

OMEGA FUEL
distributed by Morgan
Fuels, a division of Morgan
Inc., P.O. Box 1201,
Enterprise, AL 36331;
(205) 347-3525.

PRO-LINE/JACO
P.O. Box 456, Beaumont,
CA 92223; (909) 849-9781.

TAKE OFF
distributed by Schumacher
USA, 6302 Benjamin Rd.,
Ste. 404, Tampa, FL 33634;
(813) 889-9691;
www.racing-cars.com.

YOKOMO USA
Airport Business Center,
17951 Skypark Cir., Ste. K,
Irvine, CA 92614;
(949) 252-8663;
www.yokomousa.com.

LAST LAP

If you could win any race in the world, which one would it be, and why?

I'd like to win the NORRCA Truck World Cup because I love racing trucks, and I would love to win that race, especially to maintain the AE TWC dynasty!

—B.J. Williams

I would want to win the first Mini-z Worlds, if there were such an event. I'll be the Jay Halsey of 1/24 scale, baby, yeah! Who wants to win a race that somebody else has already won?

—Brad Czerniak

It would probably be the 24 hours of Le Mans. It is the most prestigious endurance race in the world—bar none. If it weren't, why would the great Mario Andretti have considered entering it at this stage of his life—to add another win to his resume? The world's top drivers try year after year to beat the clock and last that 24 hours.

—Christopher Smith

[Editors' note: we were looking for RC races, but this was a cool response, too.]

The IFMAR On-road Worlds. It's like the Super Bowl of RC.

—Steven Richardson

Dirt Oval Nationals. I race in dirt ovals weekly, and I love turning left and sliding through the corners.

—Bruce Rawleigh

I would like to win the 2WD Modified IFMAR Worlds because that is the largest and most challenging race that the RC industry has to offer.

—Ron Foxall

IFMAR 1/8 On-Road Worlds. There is no question about it; this is the “Formula 1” of RC. The best drivers, the fastest cars and the prestige that accompanies huge sponsorships make it my race of choice. The honor of being the best in the world—ranked with the likes of Mike Swager, Lamberto Collari and Adrien Bertin—would be a mark of distinction I could not refuse.

—William Jacobs

Next Saturday's race at my local club. I love to race, and I feel that club racing is where the fun is.

—Charles Valentine

I'd love the opportunity to win the Reedy Invitational Race held on Mike Reedy's birthday because only the absolutely best drivers are invited. If you can win that race, then you truly are one of the best in the world.

—Matthew Bailey

I would want to win the Reedy Truck Race of Champions because trucks are my favorite things to race, and the Reedy race is very prestigious. I always read great things about it. It would be fun.

—Jeff Packard

NEXT MONTH'S QUESTION

Do you have any pre-race rituals? Any track superstitions? Tell us about them!

Respond by clicking “Last Lap” at www.rcracing.com, or email your responses to gregv@airage.com.

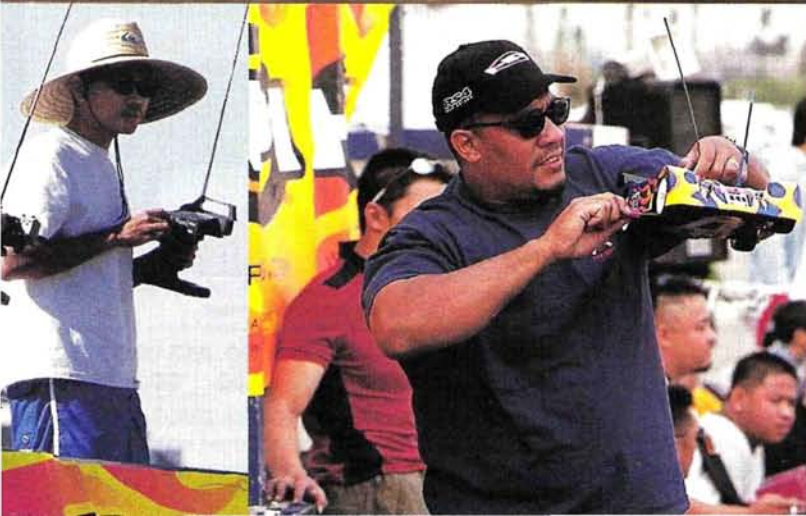
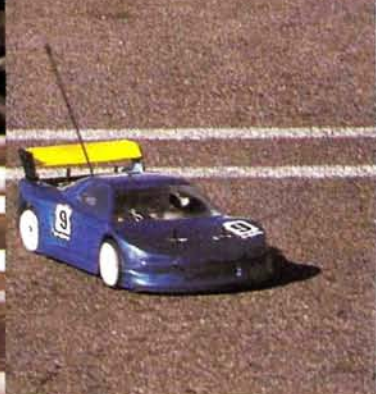


by Derek Buono

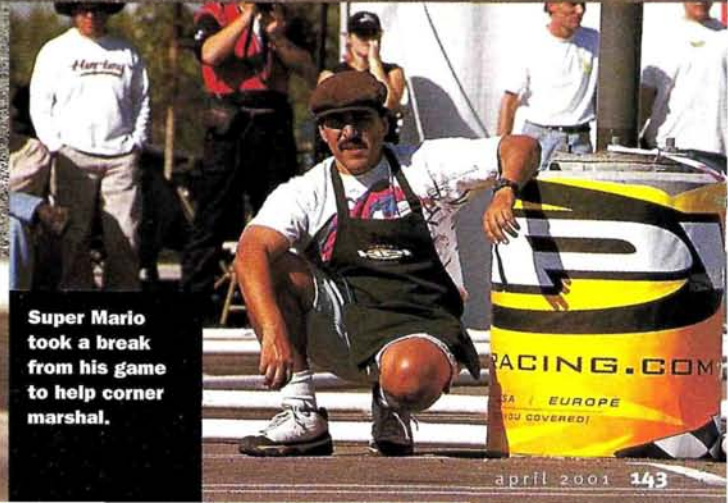
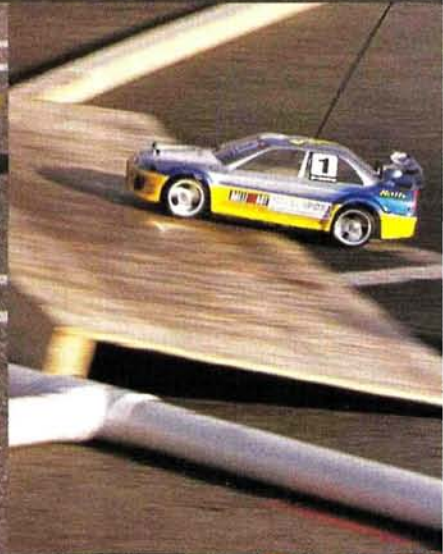
HPI CHALLENGE

WORLD FINALS

The HPI Challenge—the series that travels the globe—wrapped up another successful season in 2000. Each stop on the tour was a qualifying event for a particular region. If you win your regional, HPI will buy you a ticket to the Big Race: the World Final. The 2000 final saw racers from all over the world battling on the track for the world champion crown. Check out the action.



BY DEREK BUONO



CLASS RULES

The rules for each class are very clear, and they're strongly enforced to ensure a fair race day for everyone. The Nitro Stock and Electric Sport classes were the most heavily teched.

■ **ELECTRIC RS4 SEDAN.** RS4 Pro 2, RS4 Pro, RS4 Sport, RS4 Rally and original RS4 cars only. No structural modifications allowed (e.g., changed wheelbase). No 2-speeds; no rollover antennas.

• HPI bodies (with stock wings) and HPI rubber tires only; any brand of hop-up parts is allowed.

• ROAR stock motors only; rebuildable motors allowed. Batteries must be 6-cell packs in either prepackaged stick form, side-by-side or saddle-pack format. All races are 5 minutes long.

■ **BOX STOCK NITRO RS4.** Open only to RTR Nitro RS4, Nitro RS4 2 and original Nitro RS4 cars. HPI bodies (with stock wings) and HPI tires only.

• If a part does not come with the kit, you may not use it; 12E or 15FE engines only, with no modifications. HPI will check for drilled-out carburetors. Inserts must be run inside the side muffler. No excessive fuel line allowed. Stock unmodified plastic mufflers or "can"-type mufflers must be used. The baffle in the can-type muffler may be removed. Car-type standard glow plugs must be used. No turbo, plane, or helicopter glow plugs allowed.

• The only exceptions to the above rules are: any HPI touring-car body may be used; shock oil and piston may be changed; and HPI wheels/rubber tires/inserts may be substituted for the stock set. The original Nitro RS4 may be equipped with a ball-bearing set.

• Pull-starter must be operational at all times. Plastic side mufflers must be securely attached to the header, use the stock clear coupler and retain the plastic muffler insert.

■ **NITRO RS4 OPEN.** Nitro RS4 Racer 2, Nitro RS4 Racer, Nitro RS4, RTR Nitro RS4, Nitro RS4 2 cars only.

• HPI bodies (with stock wings) and HPI rubber tires only; any brand of hop-up parts is allowed. No structural modifications (center-tank upper decks, larger fuel tanks, changed wheelbase, etc.) are allowed.

• Nitro heats are 5 minutes long; A-main races are 10 minutes.

• Any .12- or .15-size "small-block" engine may be used.

■ **SUPER NITRO RS4 OPEN.** HPI Super Nitro cars only. HPI bodies (with stock wings) and HPI Super Nitro rubber tires only; any brand of hop-up parts is allowed. No structural modifications (custom upper decks, larger fuel tanks, etc.) are allowed. Super Nitro tires and wheels only.

• Nitro heats are 5 minutes, A-main races are 10 minutes.

• Any .12- or .15-size "small-block" engines may be used.

■ **RS4 RALLY.** HPI RS4 Rally cars or converted RS4 Sport/Sport 2, RS4 Pro/Pro 2 or original RS4 cars only. HPI WRC-type bodies (with stock wings) and HPI rubber tires only; any brand of hop-up parts is allowed. Rally-length shock bodies, springs and shock shafts must be used at all times. External shock spacers can be adjusted; internal shock spacers are not allowed.

• Heats and Mains are 5 minutes long.

• ROAR stock motors only; rebuildable motors are allowed.

The top three finishers in each class give their best "victory poses." Some of these guys could use a little coaching in the "posing" department, though Congratulations to all!



Super Nitro Modified



Electric Rally



Nitro Stock



Electric Sport



Electric Mini



Nitro Modified



Electric Pro



Concours



Super Canine Modified

All the winners received great-looking trophies and an HPI kit of their choice.

CLASSES

• **Nitro Stock.** The specs of the "box-stockers" were strictly enforced to keep the field as equal as possible and allow the race to be decided by drivers' skills—not their wallets. Cameron Wagner (USA) put his 12E-powered Nitro RS4 into the pole position, followed by T.J. Wilcheck (USA) and Attila Svajda (Hungary).

• **Nitro Stock final.** The Main was full of action. Cameron Wagner and T.J. Wilcheck battled throughout the race. Unfortunately, T.J. flamed out in the crucial minutes of the Main but was able to get back on the track and finish in second place. Cameron cruised to victory, finishing with a 31-lap run.

• **Nitro Modified.** With 60 drivers, this class—the largest—was very exciting to watch. Drivers could use any engine and hop-up they wanted to extract every ounce of speed from their RS4s. Johnathan Dobney (England), Simon Kau (USA) and Tracy Grieger (USA) captured the top three positions for the Main.

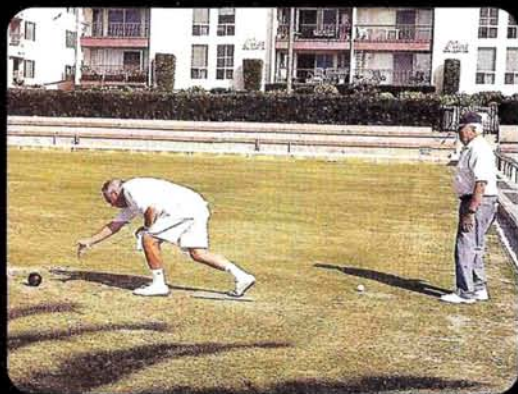
• **Nitro Modified final.** After some slight confusion about the starting format, the race was delayed when Toshiaki Koketsu needed to perform a quick repair after being hit in the warm-up. HPI graciously allowed him to quickly fix his car; then the race started. TQ Johnathan Dobney was two

laps ahead when his car hit a board and broke. Tracy Grieger and Ken Prue (USA) took advantage of the situation. After qualifying seventh, Ken made his way up to second. Tracy took the win, and Mario Caba (USA) nabbed third.

• **Super Nitro Modified.** The bigger nitro cars put some impressive speed down the lengthy straight and had some exciting action. Setsuya Kobayashi (Japan) held on to the pole by a 2-second margin over Roy Flores (USA). T.J. Wilcheck maneuvered his Super into the third qualifying spot for the Main.

• **Super Nitro Modified final.** The 20-minute final was an impressive display of raw speed and power. TQ Setsuya Kobayashi took the lead from the outset and never looked back. Dan Discenza (USA) tried his best to keep up with Setsuya, but he ended up a lap back in second. Rich Taylor (USA) and Dean Baker (USA) had the best battle of the race; in the end, Rich beat Dan by a couple of ticks of the clock.

Part of the winners' tour was a stop at the local lawn bowling field. If you haven't seen lawn bowling up close and personal, you don't know what you're missing. The action was intense!



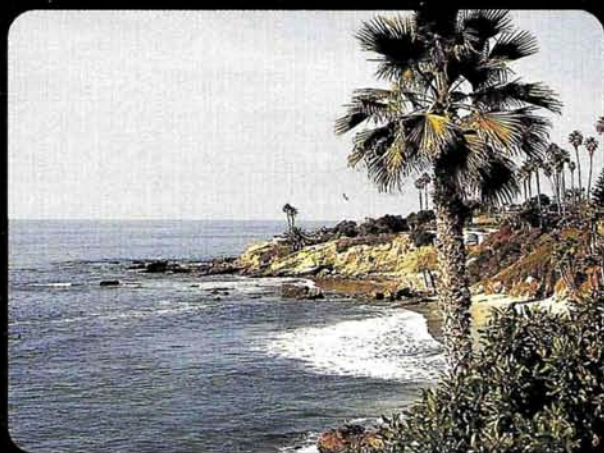
The Limo Tour

Winners and their families were treated not only to some great prizes but also to a tour of Southern California in four huge limos that looked like part of a presidential motorcade. Here are a few memories of the day:

The first stop was HPI USA, where we were given a tour and met some of the people behind the scenes. Cool things to see were the vacuum-molding machines pumping out HPI bodies.

Next stop was the beach. A quick tour of the Laguna area provided some breathtaking California scenery.

Lunch was at the world-famous Hard Rock Cafe, followed by a trip to the mall for some souvenirs.



ATTENTION TO DETAIL



The concours event is always spectacular. More than 100 cars were on display, and it was difficult to decide which body stood out from the rest. The event was actually divided into two classes: best overall and best Civic bodies. Ian Aquino stole both classes with his super-detailed rides. The Civic had a roof rack, a detailed interior, disc brakes, a radar detector, a roll cage, chrome wheels and even a working alarm.

Ian's overall winning Ford Focus drag car took him more than two months to complete. Features included a custom wing mount and wheelie bar, working headlights, disc brakes, windshield wipers, driver, an alarm, a roll bar, a roof vent and hundreds of rivets. Great job, Ian!





International participants were treated to a tent and tables, courtesy of HPI.



The Jun Civic and its matching HPI replica were at the track all weekend.

• **Electric Mini.** This was the smallest class, but it was fun to watch, anyway. The 10 cars looked cute on the large track, and they managed to turn some impressive lap times. Karlheinz Scherer (Germany) was unstoppable as he lapped the field in every

qualifying race. Even more impressive, he broke down, fixed his car, went a lap down and then won the qualifier by a lap. Ian Aquino (USA) and Nestor Rinonos (USA) tried to keep pace as they settled into the second and third positions.

• **Electric Mini final.** Karlheinz Scherer, who dominated qualifying, was a shoo-in for the victory. After crushing the field in every heat, radio interference plagued him at the start of the race, and even after a quick channel swap, he couldn't finish and ended in last place—very disappointing. The race was then up for grabs, and position changes came frequently. At the end of the battle, Joven Madriage (USA) crossed the line first followed by Josh Tran (USA) and Joe Bestor (USA).

• **Electric Sport.** To add a little speed to the "stock class," HPI opted for a 17-turn class. With 40 entries, it seemed that the European racers had the advantage in qualifying. Thirteen-year-old Kristopher Richie (Scotland) showed the old guys how to put the car on the pole. Michael Gebel (Germany) and Mark Rebeck (USA) followed the youngster on the starting grid.

• **Electric Sport final.** With qualifying so close, the Main was sure to be anything but. The first turn was rough for all, and after everyone made it through, Kristopher Richie and Michael Gebel were in first and second. At the end of the race, Gebel finished first followed by Ian Aquino and Richie.

• **Electric Pro.** The Pro class allowed any changes to be made to the car but limited the motor to a 12-turn. The combination resulted in the fastest setup for the track, and the

fastest electric cars were a full lap ahead of the Nitro Modified best pace. Kristopher Richie was the fastest again, followed by Markus Greter (Switzerland) and Masaki Yamauchi (Japan).

• **Electric Pro final.** A triple A-main was needed to decide the Pro class winner. At the start of the A1, Kristopher Richie and Markus Greter led the field. Richie made a few mistakes and allowed Greter to get by for the first win; Richie took second, and Michael Cometti (USA) was third. The second Main was very close, with six cars on the lead lap. In the end, it was Fraser Low (Scotland) who got the surprise victory, followed by Greter and Cometti. It came down to the final Main to decide the winner. Greter was determined to win, and he pulled an 18-lap run for the victory. Vincent Chu (Australia) and Masaki Yamauchi finished in second and third. With the final win of the event, Greter took the overall victory. Fraser Low placed second, and Kristopher Richie won third place overall.



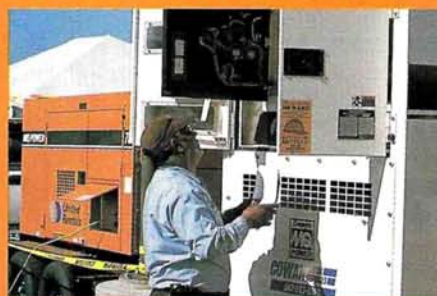
Flame-retardant suits are mandatory in Switzerland and are starting to be popular attire at tracks everywhere.

• **Electric Rally.** The rally cars followed a different race format. Gone was the standard method for qualifying; instead, every qualifier—six in total—counted toward the overall victory. The winner of each heat was awarded 95 points, so 570 was the highest a racer could score. The jumps and bumps were changed for each heat, so the drivers were challenged by a new track every time. Fraser Low vanquished the grueling track for the overall victory, with four of six wins. Ling Tong (USA) and Dave Long (USA) took second and third.

FINAL WORDS

The HPI Challenge 2000 was an international success that attracted large crowds of racers every time. The World Final brought together racers who have two things in common: a love of racing and a love of HPI's vehicles. The boys of HPI USA put on a great race, and we at *RC Car Action* congratulate them and all the participants. We look forward to next year's races. ■

HIGH VOLTAGE



Racers were treated to an industrial-size generator to power chargers, TVs—whatever. Unfortunately, the company forgot to switch the voltage back to 120; this meant several chargers released their "magic smoke" after receiving the extra current: 400 volts, to be exact. The company had to bring in another generator to fix the problem, and HPI worked on getting the racers' chargers replaced.

Supercharge that stocker!

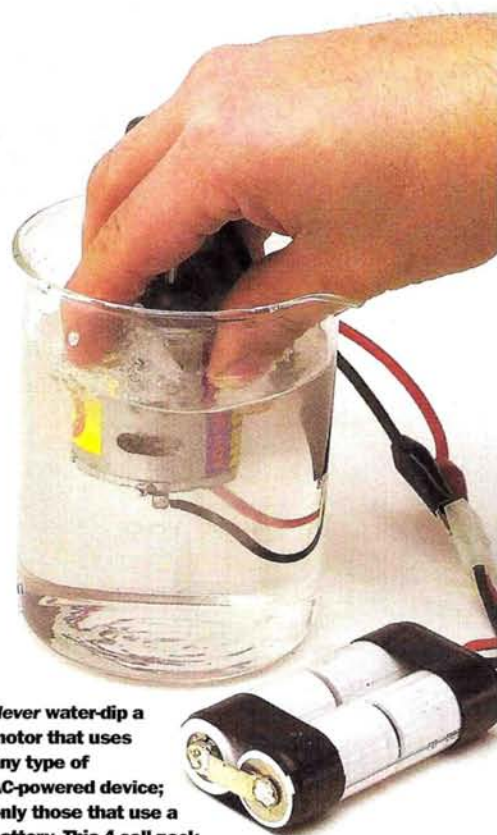
Closed-endbell motor power secrets by George Gonzalez

The closed-endbell 540-size motors that are included with many electric cars and trucks are generally long on run time but short on power, and that's one reason why machine-wound modified motors are such a hot hop-up. But you don't have to wait until you've saved enough pennies for a mod motor to start going fast; with a few classic motor-tuning tricks and the right gearing, you can make any closed-endbell stock motor pump out more ponies. Here's how to extract more power and keep your motor running fast, battery pack after battery pack.



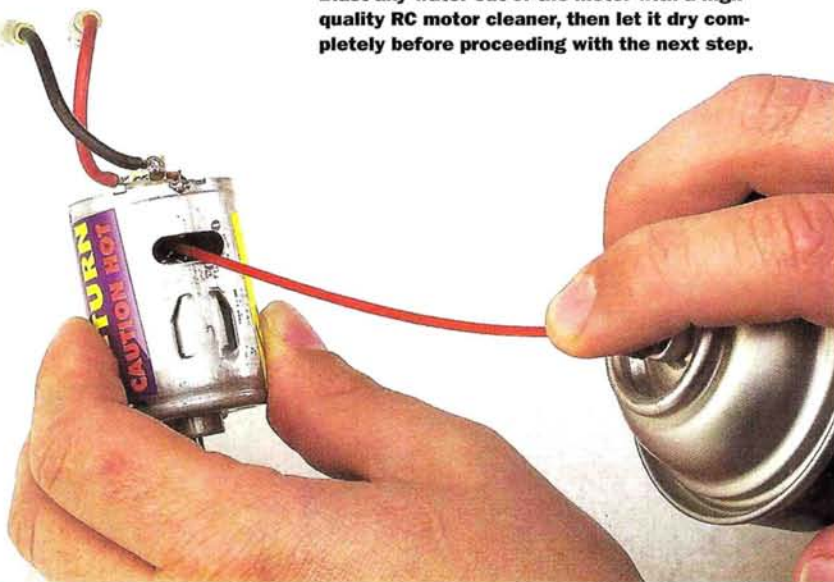
Step 1: break-in.

Attach a 4-cell (4.8V) battery pack to the positive and negative leads on the motor. Next, dip the motor (while it's running) into a cup of water for 3 seconds. Actually count out "one thousand one, one thousand two, one thousand three," then pull the motor out of the water. The water coursing between the commutator and the brushes will almost instantly shape the brush faces so they conform perfectly to the motor's comm.



Never water-dip a motor that uses any type of AC-powered device; only those that use a battery. This 4-cell pack is just an old stick pack with two cells removed.

Blast any water out of the motor with a high-quality RC motor cleaner, then let it dry completely before proceeding with the next step.



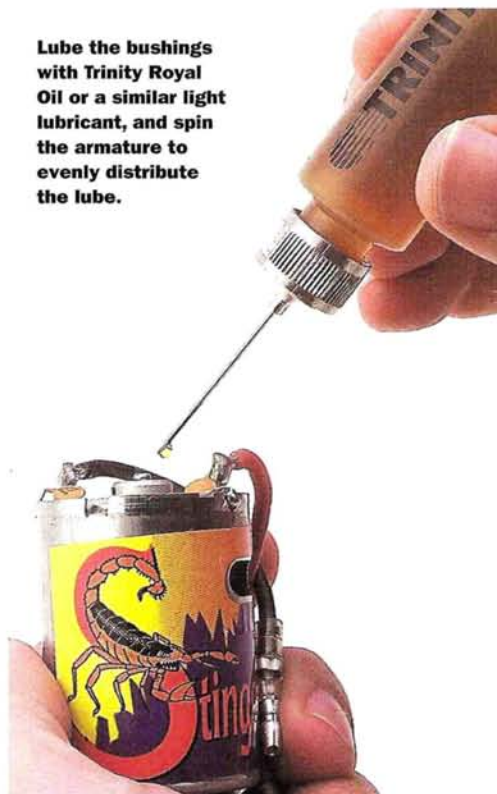
Step 2: drying the motor.

After you remove the motor from the water, spray motor spray liberally through one of the cooling vents on the motor can; be sure to saturate the motor's innards. Then place the motor on a rag so it dries, and any excess motor spray is absorbed. This will accomplish two things: first, the spray will clean the motor by removing all the carbon deposits left over from the break-in process, and second, the motor spray will displace excess water inside the motor.

Maintaining your motor

Racers are wise to clean their motors after every single run, but if you're just out having fun, you can get away with less frequent cleanings. After every five runs or so, remove the motor and give it a thorough cleaning with motor spray. After the spray has dried, relube the Oillite bushings and add comm drops to the commutator before you reinstall the motor in the vehicle. If, however, you run your vehicle in extremely dusty or dirty conditions, perform these cleanings more frequently.

Lube the bushings with Trinity Royal Oil or a similar light lubricant, and spin the armature to evenly distribute the lube.



Step 3: lubing the bushings.

After the motor has dried completely, add a couple of drops of bushing lube to the motor's oilite bushings. Trinity, Team Orion and several other manufacturers offer lube that's designed specifically for electric motors. Spin the armature to distribute the oil evenly on the bushings.

The large "window" in the can makes it easy to apply comm drops to the commutator. You need only a drop or two; more than that will just attract dirt.



Step 4: applying comm drops.

Comm drops can be applied to the commutator to increase conductivity between the brush face and commutator. Comm drops also lubricate the brushes and armature to reduce friction, and that translates into increased power and efficiency. Again, Trinity and Team Orion offer comm drops, as do a slew of other RC after-market companies.

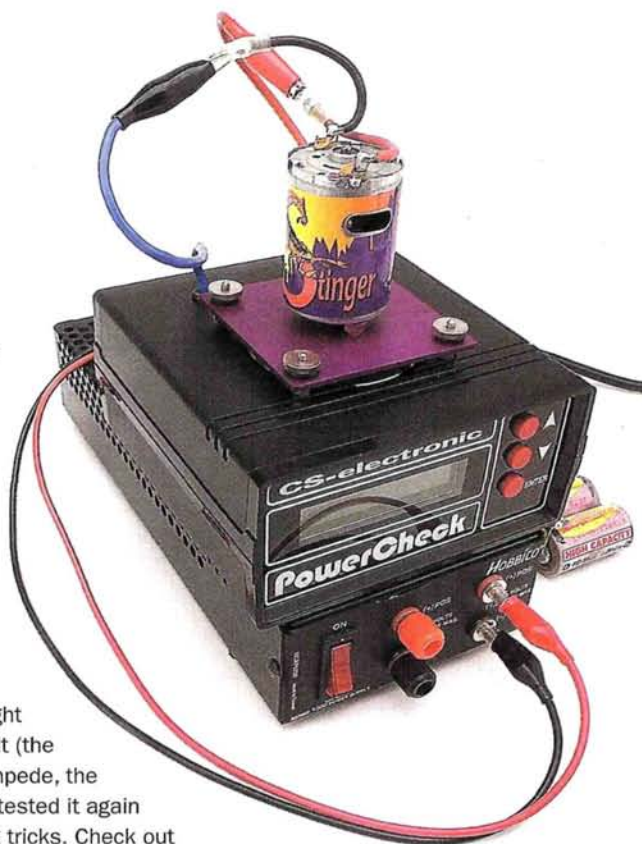
The results are in!

As the pictures show, we chose to give "the treatment" to a Traxxas Stinger. This closed-endbell motor features 20 turns (instead of the usual 27) for more power output than other 540s, but it can go even faster with the tips outlined in this article. How much faster? We dyno'd the Stinger on a CS Electronic PowerCheck dyno to find out. First, we tested the motor straight out of a never-run Traxxas Bandit (the Stinger is also used in the Stampede, the Rustler and the 4-TEC), and we tested it again after using the power-enhancing tricks. Check out the numbers:

	BEFORE	AFTER
Maximum rpm	23,923	24,370
Maximum efficiency	62%	69%
Maximum power (watts)	87.9	99.8
Rpm at maximum efficiency	19,913	18,915
Power at maximum efficiency (watts)	41	67
Rpm at maximum power	11,033	13,673
Efficiency at maximum power	41%	49%

Maximum rpm didn't increase much, but that isn't the important number—look at the power. Maximum power has increased more than 10 watts, and power at maximum efficiency is way up—from 41 to 67 watts. What does it all mean? In a nutshell, the Stinger now has more power, but it really isn't any faster—unless you gear it up. The motor's extra power can be used to turn a taller gear ratio, and that will make your car or truck go faster. Think of it this way: if you and a friend can both pedal a bicycle at a maximum of 100rpm, and you keep your bikes in first gear, you'll both have the same top speed. But if you're strong enough to pedal at 100rpm in second gear, you'll go faster than your friend will in first gear, even though you're both pedaling at 100rpm.

To get a taller gear ratio, you can install a pinion with more teeth or a spur gear with fewer teeth. Experiment for best performance, and keep in mind that a one-tooth change on the pinion is equal to a change of approximately three teeth on the spur gear. And don't forget that there's no free lunch here; if you gear your car or truck to go faster, it won't run as long on a charge. There's always a tradeoff!



SOURCE GUIDE

CS ELECTRONICS
distributed by Schumacher USA,
6302 Benjamin Rd., Ste. 404,
Tampa, FL 33634;
(813) 889-9691;
www.racing-cars.com.

MODEL RECTIFIER CORP. (MRC)
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Edison, NJ 08818-6312;
(732) 225-6360;
www.modelrec.com.

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(714) 694-2812;
www.team-orion.com.

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www.teamtrinity.com.

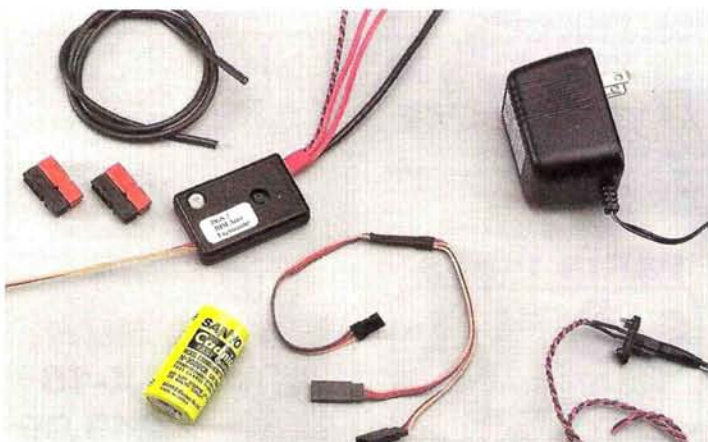
Onboard auto-glow

I have a very cool and highly beneficial product to share with you this month. It's JHM's DGS-2 digital, onboard glow system. No; it won't make your car go faster, OK? Let's get that out of the way right now. What it will give you are a more reliable idle and great low-end throttle response with a richer low-end needle setting. As we all know, this richer setting will protect your engine and potentially increase its life. Here's the best part, however: how many times have you witnessed a car doing well in a race and then seen it lose because of a glow-plug flameout. This little gem greatly reduces the flameout problem, too.

HOW IT WORKS

The DGS-2 digital box weighs only 1 ounce, is connected to an onboard rechargeable cell (any 1.2V cell will do) and can be mounted anywhere on your chassis. Using the supplied Y-harness, the unit plugs into the throttle input of your receiver along with the throttle servo. At any point

you select in the throttle throw, power is supplied directly to your engine's glow plug. A supplied LED, which can be mounted wherever you choose, lights up when the glow plug is ignited. For low-throttle reliability, have the power switch on only at idle; for improved throttle response,



Above: the DGS-2 can be ordered in two forms: for \$29, you get the digital "black box," the radio Y-harness and the remote LED (not shown). For \$66, you get the full package, which includes a Sanyo N-3000CR 1.2V Ni-Cd, Sermos connectors and a charger. Both systems include the glow-plug connector (not shown). ■ Below: Greg Vogel mounted the DGS-2 in his Traxxas Nitro Stampede, not because the Stampede or its TRX .15 engine lack in any way compared with other cars, but because it's so popular and is representative of the typical 1/10-scale nitro RC vehicle.



have the power go on at some mid or low-mid setting. Having it come on at full throttle would be pointless unless you're breaking in a new engine at very rich settings or running very high nitro with a cold plug.

I'm getting ahead of myself! For now, idle reliability, cooler running and good throttle response are reasons enough to take this product seriously.

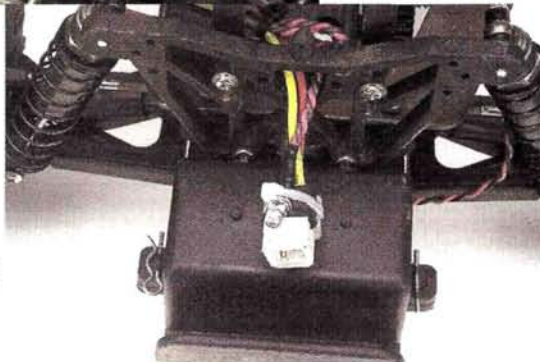
FEEDBACK FROM THE BOYS

Steve Pond, Greg Vogel, Bob Hastings and yours truly were all there during the test runs, and we all recognized the benefits of the system. Once again, these benefits are: a dramatic improvement in idle and low-throttle reliability even with a rich low-end mixture; excellent throttle response and overall cooler running.

Steve really brought into focus what this unit lets you do. As he puts it (using the TRX .15), "Without this unit on the Traxxas engine, you can go one half turn rich away from the optimum setting on the low-end needle, and the throttle



Above: this is the system's "black-box brain." Turn the plastic screw to adjust when power is supplied to the glow plug; options are anything between idle and full throttle. To the right of the label is the throttle reversing switch.



Right: this remote LED tells you exactly when power is going to the glow plug. The other plug is for charging the onboard cell.

Editor's note: read this like a rap lyric

Meet my boys,
Bob and Steve.
They're my pit crew.

Ya know dey luv me,
do my bidding.
Whateva I need
they do.

Look at Steve,
a nitro genius,
tunes a carb so
naturally.

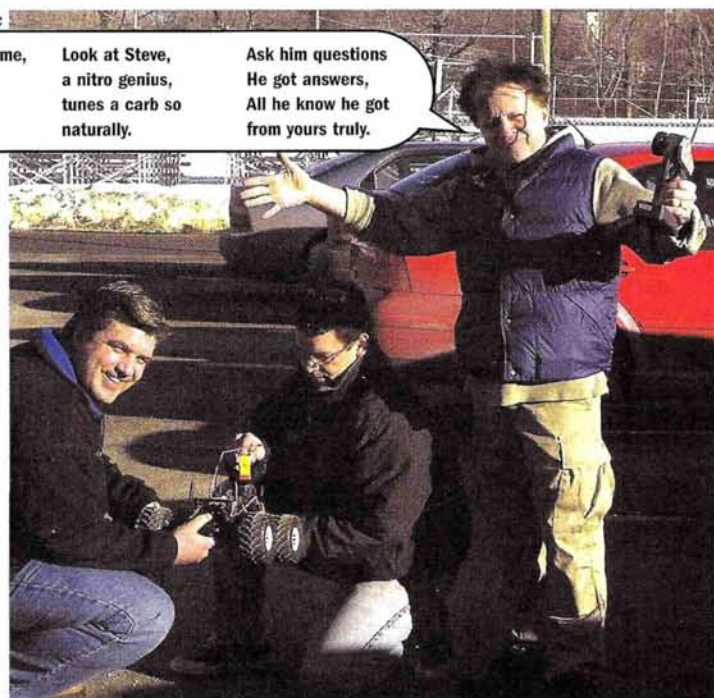
Ask him questions
He got answers,
All he know he got
from yours truly.

THINK IT OVER

With its price of \$29, I really think you guys should consider this little unit. Not only will you have more fun—and you know how important I think that is—because you'll have a much more reliable engine, but you'll also get great performance under cooler, richer running



One of the best benefits of the DGS-2 is that it allows the engine to operate at richer needle settings while still reaping full power from it. Non-critical, rich settings were particularly doable with the low-end needle, but overall lower running temperatures were experienced, even though the engine was run at full throttle much of the time.



conditions. And unless we're rich, protecting our expensive glow engines for as long as we can is very important to all of us.

At the beginning of this column, I told you this product wouldn't make you go faster. Well, I have to be honest: I'm not so sure of that. Under certain conditions—running very high nitro and using a cold, thicker, coiled

plug—supplying power to the glow plug at full throttle will advance the timing and give improved top end. That's what those speed hungry guys do—and so can we. But that's another story for another time. ■

SOURCE GUIDE

JHM AERO ENGINEERING
123 Radford Cir., Marietta, GA
30060; (770) 438-7146.

TECH Q & A Inside the 4-stroke engine

Q I build high-performance race engines—everything from drag bikes to sprint cars to diesel tractor puller engines—so I was interested in your "Big-Block 4-Stroker" article. I have three questions:

1. How does this engine lubricate the rod bushing, the cam lobes and rockers, since the fuel/oil mixture doesn't seem to enter the crankcase as it does in 2-stroke engines?
2. How is the crankcase pressure vented or equalized? In one picture, it almost looked as if there was a port beneath the cylinder on the rear of the engine.
3. If the fuel/oil mixture is not used to lubricate the engine, wouldn't you make more power by eliminating the oil from the fuel? My experience tells me that oil in the combustion chamber leads to detonation and power loss.

[email]

JIM STAMPFEL

A It seems the 4-stroke really touches a nerve with us gearheads. I know I love them. It's almost the only engine I use in my RC airplanes. I have every type: singles, twins and even multi-cylinder radial types. They all run so well; that's why I'm trying to promote their use in cars more. Here are the answers to your questions.

1. The fuel does enter the crankcase by means of blowby relief channel(s) at bottom dead center. The positive pressures created by the piston coming down

at very high speed push the oil into virtually every possible nook and cranny in the engine. Even the rocker arms are drenched with oil that is forced up the pushrod tubes.

2. Most crankcase venting is accomplished simply by putting a pressure fitting on the backplate or somewhere on the front housing; this encourages oil migration to the crankshaft bearings. I've seen some manufacturers actually put the fitting behind the camshaft housing and even go so far as to put a tube on the fitting and run the tube to another fitting on the intake manifold. The thinking here is that the negative pressure supplied by the intake will suck oil to the front of the engine where the main and camshaft bearing are. The O.S. .40 is a bit of a mystery. It's the first 4-stroke I've ever seen with no visible venting, and a 4-stroke crankcase must be vented. It's possible that the venting is being done through the crankshaft ball-bearing cages. This would certainly supply excellent lubrication to these bearings, which is an area that does occasionally fail in 4-strokes. This, however, is only a theory, as I haven't yet taken one of these engines apart. I'll get back to you on this one.

3. As you can now see, the oil is needed in the fuel, but you are correct: anything—in this case, oil—that displaces the "burnable" stuff (nitromethane and methanol) will cause some power loss. This is why top sponsored road racers cut their oil to a bare minimum. But before you decide to do the same thing, remember: they get their engines for free!

CC

Send your nitro-related letters to ChrisC@airage.com, or "Piston Power," *RC Car Action*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Build Perfect Shocks

Get smooth! by Peter Vieira

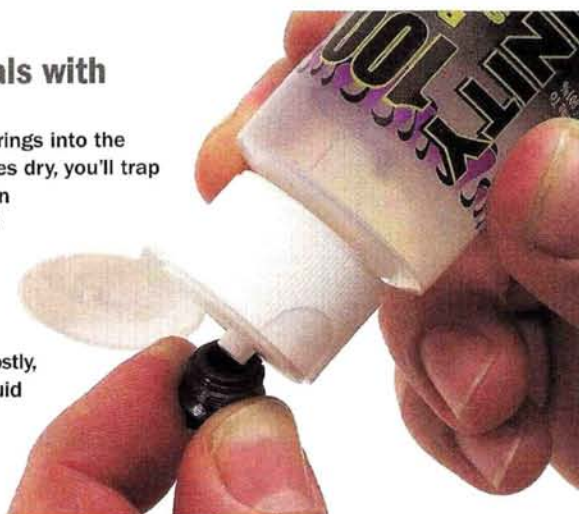
Everyone likes to show up at the track with a new or freshly rebuilt car or truck. When your machine is clean and everything is adjusted right, you feel ready to take on everybody, and they all notice when your rig looks freshly dialed. And what's the first thing they do after saying, "Looks good"? They pump the suspension. This is the acid test. If the shocks compress silently and smoothly, you're The Wrenchmaster. But if they squish down with tight spots or a bubbly crackle, you're a hack. Here's how to make 'em think you're The Wrenchmaster!



This "how-to" is about getting the best action from your shocks, but it's also important that each shock pair is the same length. Measure carefully with a caliper, or use a jig such as this Trinity Shock Dyno to do the job right.

Prepack the seals with shock fluid.

If you simply load the O-rings into the shock bodies or cartridges dry, you'll trap air in the spaces between the O-rings and the body or cartridge, and the air will be pulled into the shock body when you cycle the piston up and down. To prevent this (mostly, anyway), squirt a little fluid into the recess for the seals and onto the O-rings and any spacers before you install the parts.



This Team Losi seal cartridge is getting a drop or two of shock fluid before the O-rings and spacer are installed.



It's always a good idea to install fresh O-rings when you rebuild your shocks. Use factory replacements, or try a set of Ultra-O rings from Acer Racing, available for just about all brands.

Use Green Slime.

Green Slime is Associated's shock-seal lube; it reduces stiction (the tendency of the O-rings to stick to the shock shaft), promotes smooth action and helps reduce shock-shaft scuffing. A little dab on the seals is all you need. Some guys substitute Noleen seal grease or similar lubes made for motocross bikes, but I suggest you stick with the RC stuff.



A little Green Slime helps reduce stiction, protects the O-rings and promotes better sealing.

TIPS FOR ASSOCIATED SHOCKS

Associated's race-proven shocks are top-filled but do not use bladders. To minimize the amount of air in the shock, fill it until there is a dome of fluid at the top of the shock body. Next, fill the cap with fluid and try to quickly assemble the shock in an effort to get more fluid in. Screw the cap on until it is a couple of turns away from fully tight. Slowly compress the shock to bleed out extra fluid, then tighten the cap when the shock is fully compressed.

Don't forget to first install the thin O-ring that seals the shock cap!



Tilt the shock as you fill it.

As you pour the fluid into the shock, drizzle it down the side of the shock body. If you blast the goo straight into the shock body with a firm squeeze of the shock-fluid bottle, you'll be blasting bubbles in as well. Let the fluid flow gently down the side of the shock body to avoid this; it's just like pouring a root beer into a tilted glass to avoid getting a head on it.

Tip the shock body as you fill it, and pour the fluid down the side of the body to avoid creating air bubbles.



Don't fill the shock completely

—at least, not until you've released the air from under the piston. Fill the shock halfway, then slowly cycle the piston up and down to release the air. If you fill the shock just halfway, there is less fluid for the tiny bubbles that pop out of the piston holes to travel through; that means less waiting until you can finish off the shock, especially when building long-travel truck shocks. When the last tiny bubble breaks the surface, finish filling the shock.



If you have a mismatched set of shock fluids, do yourself a favor and get a fresh set from the same maker; your "brand X" 30WT could actually be "thicker" than your "brand Y" 40WT. Trinity offers its Kinwald Pure Silicone line in full- and half-weights and measures viscosity before it goes into the bottle. Team Losi's Certified fluid line is also popular.

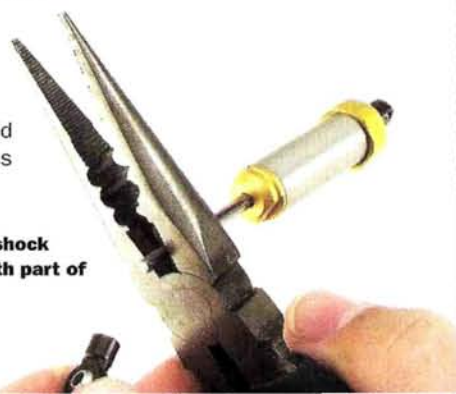
Don't scar the shock shaft.

You know better than to grab the shock shafts with a pair of bare pliers when you thread on the shock eyelets; right? Of course you do. The trouble is, whatever you use to pad the jaws makes it hard to hold the shaft tightly enough to prevent it from turning. There are a few options:

- Clamp the shaft by its threads with the cutting jaws of the pliers. This works great, but you can only thread the eyelet onto the shaft up to the pliers, leaving at least one thread exposed. The spring perch will cover it, and the extra millimeter or so it adds to the shock's overall length won't affect most vehicles; but if you're slamming a sedan, it might matter.

- Use a DuraTrax shaft holder. It's just a brass disc with a slot to hold the steel shaft, but it works; brass is softer than steel, so it doesn't scar the shock shaft, but you get a solid metal-on-metal bite when you squeeze the brass down on the shaft with pliers.

With the cutting jaw of a pair of pliers, hold the shock shaft by its threads. If you don't touch the smooth part of the shock shaft, you won't be able to damage it.



WHAT IS "VOLUME COMPENSATION"?

Everybody knows that if you fill a drinking glass to the brim with water and then drop in an ice cube, the water will overflow because the ice cube displaces an amount of water that equals its volume. The same thing happens inside a shock absorber as the piston and shock shaft are pushed into the shock body. The parts displace an amount of fluid equal to their volume. But unlike water in a glass, the fluid in a shock has no place to go and cannot be compressed; that's why all fluid-damped shocks need some type of mechanism to compensate for the volume of fluid that is displaced—hence the term "volume compensation."

The simplest way to compensate for the excess fluid is to mix air with it. Since air can be compressed, the tiny air bubbles in the fluid simply shrink as they are squeezed by the action of the shaft and piston. This is the type of system used by Associated, and it's known as an emulsion design because the air is mixed (emulsified) with the shock fluid. For best results with an emulsion shock, pump it before each heat to thoroughly mix the air and shock fluid. The bubbles become microscopic and are impossible to feel in the shock stroke.

Bladders work much like emulsion shocks by using air as a compressible medium, but the bladder prevents the air and shock fluid from mixing. Basically, the air is trapped in the shock cap as one big bubble. When the shock is compressed, the bladder is pressed into the cap, and this compresses the air. The compressed air creates a sort of rebound effect at the top of the piston stroke; to avoid this, some racers drill a small hole in the cap to vent the air trapped inside.

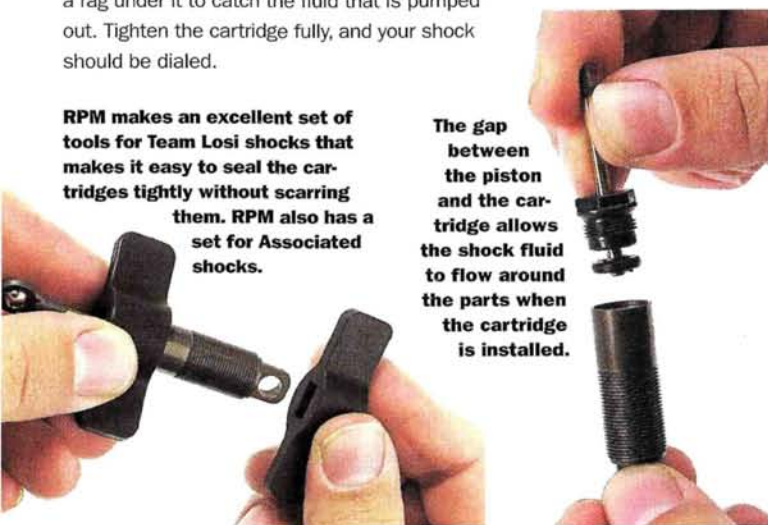
Schumacher, Associated VCS and Progressive Suspension shocks use foam elements that compress to accommodate the shock fluid displaced by the piston and shock shaft. Before you install the foam elements, be sure to soak them in the same shock fluid as you use to fill the shock.

TIPS FOR BOTTOM-FILLED SHOCKS

You'll find bottom-loaders on Team Losi, Schumacher and the latest Kyosho racing vehicles (actually, the Kyosho's dual-cap dampers can be top- or bottom-filled, depending on how you build them). The key to building the perfect bottom-filled shock is to fill the shock up to the threads for the seal cartridge and install the seal cartridge/shock shaft/piston assembly with the piston a millimeter or two above the cartridge. This will allow the shock fluid to flow completely around the piston and minimize the amount of air that's trapped in the spaces between the parts. Thread the cartridge into the shock body, but stop a few turns before it's tight. Push the shock shaft into the shock while keeping a rag under it to catch the fluid that is pumped out. Tighten the cartridge fully, and your shock should be dialed.

RPM makes an excellent set of tools for Team Losi shocks that makes it easy to seal the cartridges tightly without scarring them. RPM also has a set for Associated shocks.

The gap between the piston and the cartridge allows the shock fluid to flow around the parts when the cartridge is installed.



TIPS FOR TOP-FILLED BLADDER SHOCKS

Kyosho, MRC, Tamiya, Traxxas, HPI, DuraTrax and many other brands use this design. Just fill the shock up to the top of the threads, then push the bladder into the top of it (having first wrapped the shock in a rag to catch the fluid that is displaced). Thread the cap on a few turns, then slowly compress the shaft halfway into the shock. More fluid will be pumped out; that's OK. Lock down the cap and fully compress the shaft. If it won't go in all the way, loosen the top cap again to let the piston slide higher into the body and bleed out more oil. Retighten the cap, and you should be able to bottom out the shock shaft. After you release it, the shaft should reemerge from the shock by itself and extend to about half of its full travel, and you should be able to cycle the shaft up and down without hearing air bubbles crackling in the fluid.

SOURCE GUIDE

ACER RACING
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ASSOCIATED ELECTRICS
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Brass tubing 101

Tube-frame RC monster trucks are growing in popularity and are showing up everywhere. The NR/CTPA has even started a class just for trucks with this type of chassis. Tube is not limited to the chassis; it can also be used to make realistic roll cages. Brass tube is the easiest to use; it's cheap, easy to bend and solder and readily available at most hobby shops.

This month, I show you how to construct chassis and roll cages out of brass tube. It isn't difficult, and the results can be impressive.

CHASSIS DESIGN

Depending which truck you want to make a chassis for, you might have to tweak its design so that it will work with your truck's vital components.

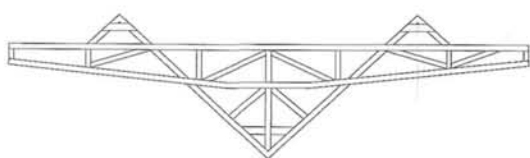
Designing a chassis is easier than you think. Draw it so that you have a template when you start to build your chassis. It's easiest to draw your design on graph paper

rulers and so on.

If you have the right computer and software and want maximum accuracy and speed, use a CAD (computer-aided-design) system; CAD programs can cost as little as \$100.

• **Measure your truck.** I start by measuring the length of the body so that I have a rough idea of how long or short the chassis can be. The truck's wheelbase is also a very important dimension. Start drawing the chassis by marking a centerline on your paper. Figure out how long you

want the wheelbase to be and halve it. If you want a 14-inch wheelbase, make a mark that is 7 inches away from your chassis centerline—one to the right of the centerline and one to the left. These marks will show the centerlines of



Here is a chassis layout that I created quickly using a CAD program. This can be printed full-size and used as a template to make your chassis.

using a ruler and a pencil. If you want to produce a more accurate layout and you have the equipment and knowledge, use a drafting board and drafting tools, including circular templates, triangles, scale

This truck has a 14-inch wheelbase. To get the mounting points for your suspension links, you will have to do a little math and take a few measurements.



Dave Pack (Richmond, VA) made this tube-frame chassis and roll cage. Featured in the March 2000 issue of RC Car Action, this is a fine example of what can be done with brass tube.

your front and rear axles. With the assembled axle and suspension links in your hand, measure from the axle centerline to the center of the suspension-link mounting hole where it's attached to the chassis. Say, for example, that this measurement is 6 inches. Go back to your layout, and make a mark that's 6 inches away from the axle centerline toward the chassis centerline. This will show you where the suspension links' mounting holes should be on the chassis.

Remember that brass is a relatively soft metal, so design your chassis with that in mind. If you look at the frames on full-size monster trucks, you'll see that they have many triangulated sections that strengthen the chassis. If you built a chassis using only straight pieces of tube, it would bend easily. Triangular sections can withstand fairly heavy forces.

• **Mounting the ESC, battery, shocks, etc.** This is totally up to you. It is best to mount them on flat stock, which is much easier to drill holes in and makes a good mounting surface for the parts you want to attach to it. Just solder the flat brass strips to the tube wherever you want them. Position the strips on your chassis so that if you have to drill a hole in them, the hole will be between the tubes.

• **Make copies of your design.** When you have a chassis layout drawn on paper, make copies.

You'll use the paper layout as a template to place the pieces of brass where they belong before you solder them together. The paper layout will also give you something to refer to when you cut the tube to length and bend it to shape. The paper will soon wear and be unusable, though, so be sure to make extra copies.

ROLL-CAGE DESIGN

If you have constructed a tube-frame chassis for your monster truck, you will probably want a roll cage to go with it, or you might want to make one to fit your current chassis. Before you start, choose the body you want for your truck because the roll cage will be constructed to fit the body. Once again, look at roll cages on full-size



A roll cage I made for one of my hotter projects. You don't need a tube chassis to add a realistic roll cage. This one is attached to the chassis with screws.

trucks for a reference.

Making a roll cage is a bend, cut and fit process; there is no right or wrong way to do it. I like to start with the section that loops from the chassis up into the rear of the cab and then back to the chassis; it's a main piece, and the rest of the roll cage will be attached to it.

I construct the loop so that it is a little too long on both sides, and

then I cut it to the proper height. To figure out what the height should be, put the body on top of the chassis to get an idea how high it should sit when it's finished.

Take the body off the chassis, position your tube loop inside it, eyeball where the chassis will meet it, mark a line on the tube and cut each side off at the correct length.

Now you have to position the loop on the chassis so that the body is centered from front to back. Once again, hold the body on the chassis to see where it should be sitting, and mark the spot on the chassis where the back of the cab sits.

Finally, solder your tube loop (roll cage) into place, using only just enough solder to hold it there; you can remove the loop to reposition it if necessary. Be sure that it is perpendicular to and square with the chassis. Lightly rest the body

kind of project. It has a high melting point and is very strong.

Put your chassis layout on a flat surface. First, you'll solder together the pieces for one half of the chassis, and then you'll assemble the other half. You'll then connect the halves with the cross-members. When you've cut and bent your tube pieces to shape, you are ready to solder; clean the areas where the solder will go with steel wool or fine-grit sandpaper to remove the oxidized layer that forms on brass and make a better surface for the solder to stick to. Position the tubes to be soldered where they belong on the copy of your layout. You need a way to hold them together while you're soldering—something heavy. Or if you are working on a wooden surface, use small nails. Soldering pads are also available; they won't burn, and



Above Inset: always clean the brass (I use steel wool) before you solder it; the solder will stick better. Above: the basic tools you'll need for this type of project. The flux helps to clean the brass and allows the solder to flow better; the solder holds the tubes together; the soldering iron heats the brass and allows the solder to run; and the torch cleans up the joints.

on the loop to check that it is where you want it; if it is, finish soldering around the tube to secure it. As far as the rest of the cage goes, take your time; it will seem to fall together.

Look at a full-size cage and copy the pieces; check the body often to see whether your parts fit as they should.

SOLDERING

This is very important to ensuring a well-constructed chassis or roll cage. You must use strong solder, and silver solder is best for this

you can push small pins through them to hold the brass pieces in place while you solder.

I choose a high-temperature soldering iron to tack the pieces into place. Before applying solder, coat the joints with a high-quality flux to clean the surface and help the solder to flow better. Once the section of the chassis is finished, flip it over and tack the other side of the joints.

Now use a small blowtorch with a fine flame to carefully heat the joints to get the solder to flow. This will make the joints look

Bending and cutting

Brass is soft and isn't easy to bend properly by hand; it flattens (or "crimps") at the bend. Special benders will help you to achieve the shapes you want; the tools have a round shape, and you'll need one with a concave "groove" that is close to the diameter of the tube you want to bend. Put the tube on the bender, bend the tube around it, and the tube won't flatten. Even when using a tool, though, try to avoid having to make bends that are too tight; a tube can only be bent so far before it starts to deform. Before you bend the tube for your chassis or roll cage, practice with a few pieces to get the hang of things.

Brass is soft, so it's easy to cut with a rotary tool and cutoff wheel, a small X-Acto saw, a sharp X-Acto blade, or a tube cutter.

- **Rotary tool.** If you use a cutoff wheel, you must wear eye protection; particles of brass may be thrown into your eye, or the cutting disc may shatter. If the tube extends more than an inch or so past the cut, the tool's handle will be in the way and won't permit you to make a perpendicular cut. You could cut your tube slightly long at an angle and then make a straight cut, but that wastes material and time.



If you plan to cut the tube with a rotary tool, remember that you will only be able to cut short pieces because the handle will get in the way, and you'll end up cutting it at an angle; you will have to turn it around and cut it again to make the end perpendicular.

- **X-Acto knife.** When cutting with an X-Acto knife, place the tube on a hard, flat surface, put the knife on the cut line, and while applying pressure with the knife, roll the tube back and forth until it has cut right through the brass. When you're rolling the tube, be sure keep the knife perpendicular to it. If it is on an angle, the knife will "walk" along the tube.

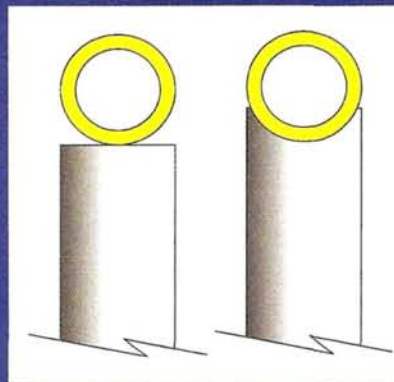
- **Tube cutter.** Tighten the cutter around the tube until it fits snugly. Turn the cutter one revolution and tighten it; repeat the process until the tube is cut through.



This small tube cutter from K&S does a fine job. If you don't have a tube cutter, use a sharp X-Acto knife, and roll the tube to and fro on a flat surface while pressing down firmly with the knife.

When you start to solder the pieces together, for the best fit, you should "fish mouth" the end of the tube where it meets another piece. I'll explain "fish mouth": Instead of leaving the end of the tube flat, you cut a C-shaped curve in it so that it fits around the outside of the tube you're joining it to. This is not that easy to do, and it is time-consuming (and not as structurally sound). The open space between the two tubes can be filled with solder.

The drawing on the left shows two pieces of tube together with the joining edge cut flat. If that piece of tube takes a hit, that joint can easily fail. If you round out or fish mouth the end of the joining piece so that it fits around the tube, your joint will be much stronger.



cleaner and ensure that the solder covers the joint entirely. If there are holes in any of the joints, you can fill them with solder later. The soldering iron will give you better control when patching holes. If you go a little overboard with the solder and it starts to run or looks bad, just wipe it off. Just heat the area you want to clean until the solder begins to melt, and then quickly wipe it away with a damp rag. Be

careful not to burn yourself with the hot solder. If you are still not happy with some joints, clean them with a small round file; you can also shape them with body filler if necessary.

PAINTING

Before you paint your creation, test it to see whether any areas need to be strengthened. Build the truck and drive it like you stole it; if your new parts break or fail to work as you want them to, you will be able to fix them. Once you've painted the brass, it is difficult to fix a solder joint.

Scuff the surface of the bare chassis and/or roll cage with steel wool to clean it. Wipe everything with denatured alcohol to remove any leftover flux or oils from your fingers. Give the brass a few light coats of a high-quality primer, trying to cover all areas without getting runs or drips. Use a good automotive paint to cover the brass because you want a paint that's hard enough to resist being chipped.

It is best to lay down your paint with an airbrush; it gives much more control over where and how the paint covers the brass. If a spray can is your only option, mist the coats on lightly; don't overdo it. Paint from every direction to ensure a full paint coverage.

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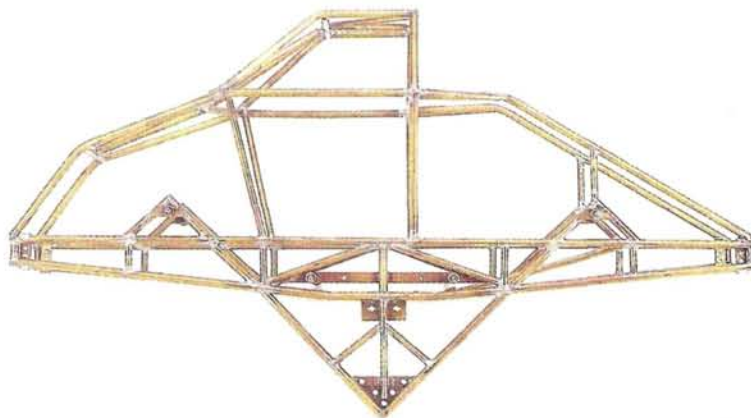
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OFNA Monster Pirate 2-speed transmission

If you own an OFNA Monster Pirate, you know that when you peg the gas, it lights up the tires and shoots out of the hole. Now, you can add a little more to the insanity! OFNA now offers a 2-speed transmission for the huge truck. It features a finger-type clutch and two huge Delrin gears. Three gear sets are offered for the 2-speed—48/52T (84181), 52/56T (84152), 56/60T (18910). Gears are also available for the clutch bell—11/15T (84180), 12/16T (84179).

Monster Pirate 2-speed transmission—18990.



Here, I'm working on a chassis for a Tamiya Juggernaut, and it's so close to completion that you can see what it will look like when it's completely finished.

THAT'S IT!

These are basic tips that you need to know if you're to construct anything out of brass tube. You should now be able to construct a fully

functional tube chassis that is guaranteed to turn heads wherever you go. Let those creative juices flow! ■

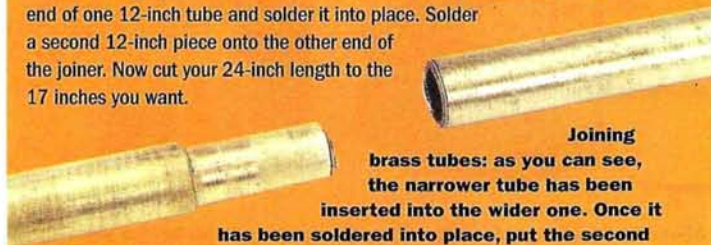
Where to get brass tube

You'll find brass tube at most hobby shops, and it's available by mail order and from hobby-supply catalogs. Once you have your chassis drawn on paper, you will have an approximate idea of the lengths and diameters you will need for your project. Brass tube is available in 1- and 3-foot lengths; start with a total of 9 feet, and I suggest the 1/8-inch diameter.

Joining brass tubes

If you can't find a tube that is long enough for what you're building, you can join pieces. If you need a 17-inch piece and your tube is offered only in a length of 12 inches, here's what you do:

- You'll need three tubes—two 12-inch outer tubes and a 3/4-inch joiner piece that has a slightly smaller diameter. Insert half of the joiner tube into the end of one 12-inch tube and solder it into place. Solder a second 12-inch piece onto the other end of the joiner. Now cut your 24-inch length to the 17 inches you want.



Joining brass tubes: as you can see, the narrower tube has been inserted into the wider one. Once it has been soldered into place, put the second wider tube over it and solder it into place.

SHOP TALK

I know that Traxxas sells a fixed differential for the T-Maxx (posi-action). My Stampede is only a 2WD, but if I could find a fixed differential for it, it would really help my off-road capabilities. I was wondering if you might know where I could find this type of diff for my Stampede, or how I could make one. [email] CHRISTOPHER ST. PETER

I called Traxxas to get the skinny on your differential question. Traxxas doesn't offer a solid differential as a factory option for the Stampede. One way you could lock out your differential would be to open the diff, clean off all the grease from the gears and fill the differential with some strong epoxy. Keep in mind, however, that once you do that, you'll never be able to separate those differential gears again. If you later decide you're unhappy with their performance, you'll have to buy a new diff gear set. I would only recommend this modification for dirt use. If you drive your truck on any other surface, you risk damaging the other transmission gears.

If you have any problems or questions about trucks, or if there is something you would like to see in "4x4," email me at kevinh@airage.com or send your letters to:

"4x4"
RC Car Action
100 East Ridge
Ridgefield, CT 06877-4606 USA



Upgrade to a Tuned Pipe

Bolt on power

by Derek Buono

Many nitro-powered cars include model-airplane-style canister mufflers that are good at keeping engines quiet but not very good at maximizing their performance. In general, canister mufflers limit power and make engines run hotter at a given power output. By replacing the canister muffler with a tuned pipe and manifold, you can increase power, reduce heating and improve efficiency. It isn't difficult to make the switch; here's how.

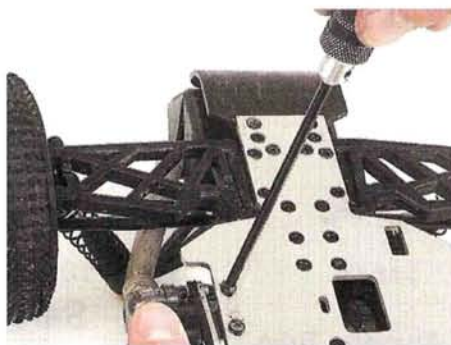
Choosing a pipe and manifold

When you choose new exhaust parts, your first stop should be the kit's manual; if the kit includes a cast muffler, it's a good bet that a tuned pipe and manifold are listed as optional parts along with any hardware required to install them. If the manual isn't helpful, consult your hobby dealer. Depending on which type of vehicle you own, you may need a specialized type of manifold. Any type of tuned-style pipe will outperform a muffler, but there are differences among pipes that affect performance. Again, to help you determine which pipe best suits your needs, consult your manual, the manufacturer's website, or your hobby shop.



1 Clean your car.

You don't want to get any junk in the engine or in your new pipe, so a clean chassis is a must-have before you begin to wrench. HPI, Traxxas and Trinity all make nitro car cleaners that help get rid of the sticky stuff. You can also use denatured alcohol in a pump bottle.



2 Remove the engine.

It may be easier to remove the engine from the vehicle first. If so, remove the mounting screws.

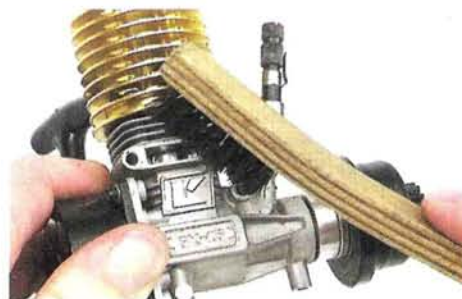


3 Remove the manifold.

Start by loosening the manifold screws (the long screws that pass through the engine case, just under the heat-sink head).



The muffler and manifold assembly may be stuck in place by a gasket; if they are, a tug should break them free.



4 Examine the exhaust gasket and exhaust port.

If the gasket is worn or damaged, replace it with a fresh one (your new manifold may include one), and remove any leftover gasket material from the exhaust port. If the old gasket is toast, and you don't have a new one, high-temperature sealant can be used as a substitute; when you're ready to install the manifold, smear on a thin film of the stuff, but be careful not to get any goo in the engine or manifold. If you do, wipe it off with a cotton swab.



5 Flare the manifold and pipe.

Insert a round-shank Phillips screwdriver in the pipe, and rotate it as you pull it against the pipe wall. After a few passes, the pipe should have a slight flare. Repeat this process with the manifold. The thin lip created by the flare will help the soft silicone coupler hold the parts securely.



6 Attach the new manifold to the engine.

Depending on which manifold you choose, you may be able to thread the original manifold bolts directly into the manifold, or you may need longer bolts and nuts to clamp the manifold into place. Some manifolds come with new hardware. In any case, apply thread-locking compound to the hardware, and make sure the parts are tight.



7 Attach the pipe to the manifold.

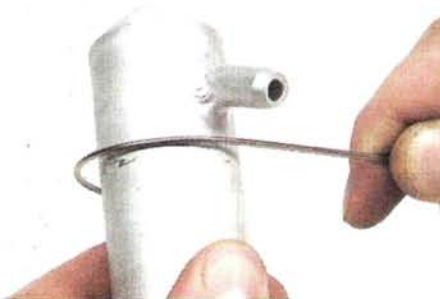
Use a silicone coupler (GS Racing, OFNA, Dynamite and others offer a variety of colors and styles) to connect the pipe and manifold, but make sure the parts don't touch each other inside the coupler.



Use a wide zip-tie on each end of the coupler to squeeze everything together tightly.

Now all you have to do is reconnect the fuel tank's pressure line to the pipe's pressure fitting, and you'll be done. Your engine will have a raspier, tougher-sounding exhaust note and crisper throttle response, and you'll be able to safely run a leaner mixture setting for more power throughout the rpm range. And the old, cast muffler? Toss it; once you try a tuned pipe, you'll never go back.

Continued on page 186



8 Install a pipe stay.

Most tuned pipes have a fitting on the front end that is designed to pinch a piece of $\frac{1}{16}$ -inch music wire with a grub screw. The wire is then attached to the chassis to hold the pipe. If your pipe doesn't have a fitting to grab the wire, make a large loop to encircle the pipe.



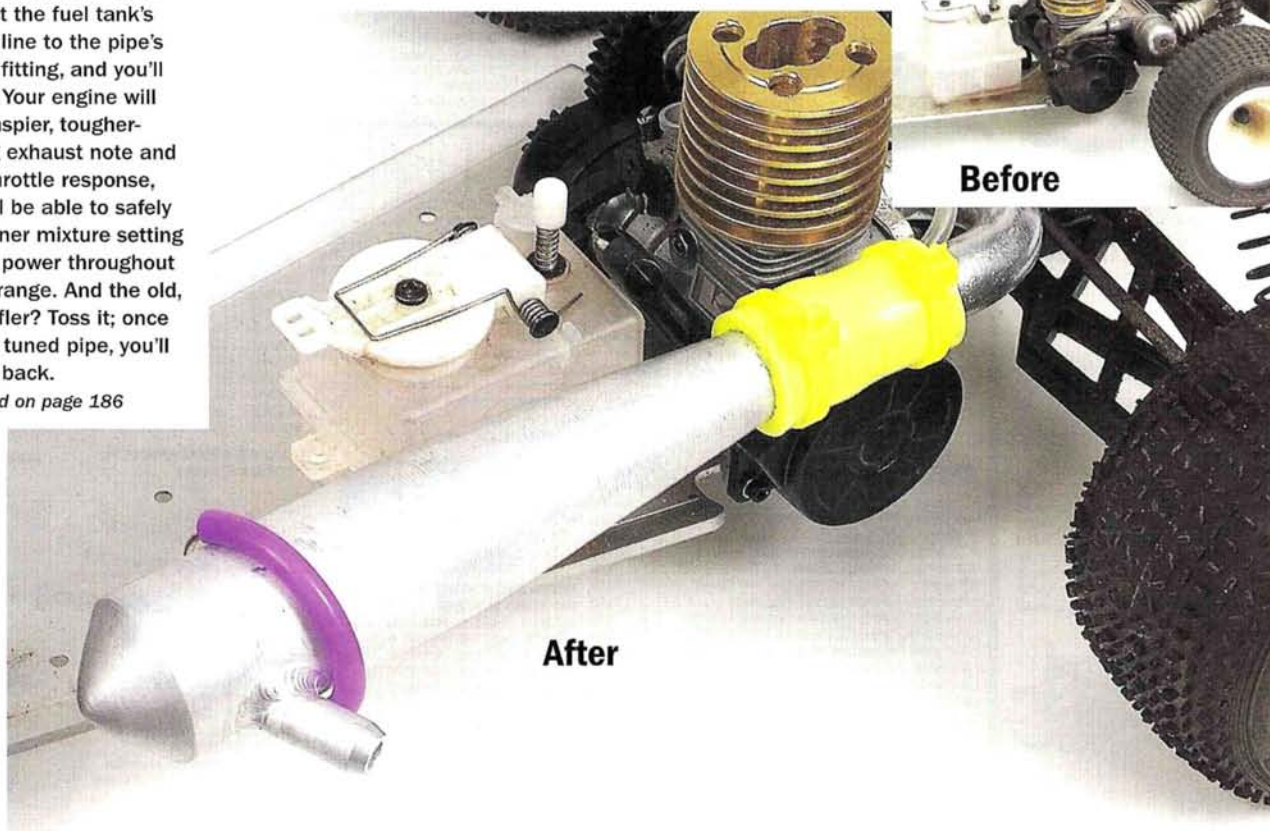
At the chassis, the stay is held in place by making a loop in the wire and passing a screw through it and the chassis; an after-market standoff can also be used.



Pad the wire with fuel tubing. There's no particular way to bend the pipe stay; just tweak it until it reaches the chassis.



Before

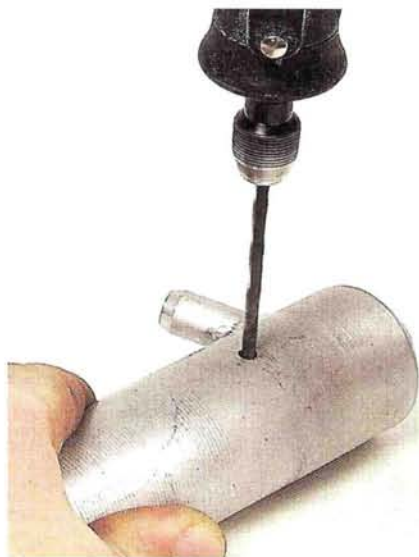


After

Continued from page 183

How to install a pressure fitting

If your pipe doesn't have an installed pressure fitting, you'll need to put one in yourself (you could just drill a hole in the pipe and jam the pressure line into it, but that's hack). Here's how to make that pressure fitting look professional:



1 Drill the hole.

Start by drilling a hole (using a no. 21 bit) through the pipe, approximately 1 inch back from the exhaust outlet and perpendicular to an imaginary line drawn through the outlet (see the illustration at right).



2 Tap the hole.

Tap the hole using a 10-32 tap. This is the most common thread used on pressure fittings; check your fitting before tapping. Use cutting fluid, and turn the tap slowly; the pipe wall is thin. Remember to dump out any chips of aluminum that fall into the pipe.

3 Apply a sealer.

Apply a bead of JB Weld or a similar high-temperature "liquid-metal" epoxy around the base of the fitting, and let it dry completely. This will seal the joint and guarantee that the fitting stays in place.



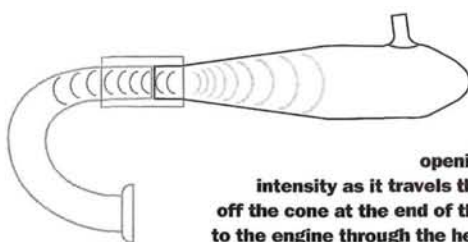
4 Install the fitting.

Gently thread the fitting into the pipe. If the fitting is a 90-degree type, and it isn't pointing where you would like it to when it's fully tightened, loosen it until it is correctly oriented (this depends on the location of the fuel tank, but most nitro guys like the fitting to point straight back to the coupler). Don't force the fitting past "tight"; you'll strip the hole in the pipe.

What Makes A Tuned Pipe "Tuned"?

For the benefit of those who want to know why a tuned pipe helps every aspect of 2-stroke-engine performance, I'll cover some of the basics.

A 2-stroke engine's intake transfer ports and the exhaust port are open at roughly the same time. This means that a portion of the fuel/air mixture that enters the engine simply passes straight out through the exhaust. It doesn't take a rocket scientist to figure out that the escaped fuel is wasted and can't contribute to making power. Many years ago, engineers figured out that by cleverly crafting the exhaust pipe into a specific shape, the exhaust itself could be used to keep more unburned fuel in the engine to increase power. Now, when the exhaust port opens, the pressure created during the combustion process creates a pressure "wave" that travels through the header and into the tuned pipe. The tuned pipe's small exhaust outlet releases some of the exhaust pressure, but a significant amount remains in the pipe. The engineers carefully "tuned" the length and shape of the exhaust pipe (hence the name "tuned pipe") to send some of the pressure wave back up the pipe to force the escaping fuel mixture back into the engine. In practice, tuned-pipe design is more involved than I make it sound, but this is generally why tuned pipes can be so beneficial.



When exhaust gases are released into the header, they travel down to the divergent cone. When they reach the cone, a vacuum, or negative pressure wave, is created by the expansion of the exhaust gases as they travel through it, and this vacuum travels back up the header and sucks any remaining exhaust gases out of the exhaust-port opening. Meanwhile, the positive pressure wave loses

intensity as it travels through the expanding divergent cone. It then bounces off the cone at the end of the pipe and is funneled back through the cone and up to the engine through the header. When the system works properly, the pressure wave reaches the engine while the exhaust port is closing, thus forcing any fresh fuel that's trying to escape back into the cylinder. ■

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Painting carbon fiber

WELCOME! We've received many enthusiastic responses to our recent painting features; the common thread among the letters, emails and chat-room conversations was that you want more! I'm proud and excited to welcome you to the premiere of "Body Shop." We'll look at various painting techniques using airbrushes, spray cans—even paintbrushes—as well as different detailing and decaling methods. We also check out some of the latest products to come on the scene in "New In The Shop." The "Fresh Paint" section turns the spotlight on you by featuring a standout body submitted by a reader.

Now, let's get into the shop!

The carbon-fiber effect is one of my favorite techniques because it's simple and quick to shoot, but it looks as if it must require an elaborate masking job. The key to carbon fiber is the mat—a toolbox drawer liner—that is used to mask the carbon-fiber "weave."



BEFORE YOU BEGIN

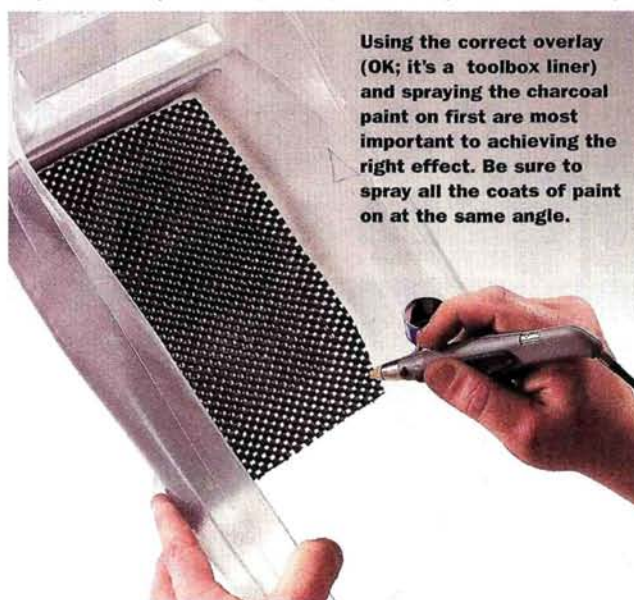
Your first time out, it's best to work with a single, flat body panel and work from there as you get the hang of the technique. A flat truck bed is a great place to start. Since this is a dark effect, use it to contrast a bright color for the best overall impact. In the photos, I've sprayed the bed of a HPI Silverado body. Using the same technique, I also did a "breakaway" as an accent on the hood and sides.

1 Prepare and mask the body as you normally would. Be sure to wash the inside thoroughly to remove any mold-release agent or contaminants that may be on it.

Decide whether you're going to paint the carbon-fiber panels first or last; I base this decision on which is easier to mask, but it's usually best to paint a dark area such as the one shown first. Here, I've liquid-masked the whole truck and then removed the masking from the bed portion.

2 Cut a large piece of the drawer liner and put it into position on the area you're going to paint. The finished paint job will look more convincing if you lay the mat so that the oval shapes of its grid pattern run horizontally, as shown in the picture. Since the liner is a non-skid material, you don't need to press it into place, but you may need to tape its

edges in a few spots to hold it in position. I've



Using the correct overlay (OK; it's a toolbox liner) and spraying the charcoal paint on first are most important to achieving the right effect. Be sure to spray all the coats of paint on at the same angle.

found that the mat follows tighter contours if you first warm it with a hair dryer.

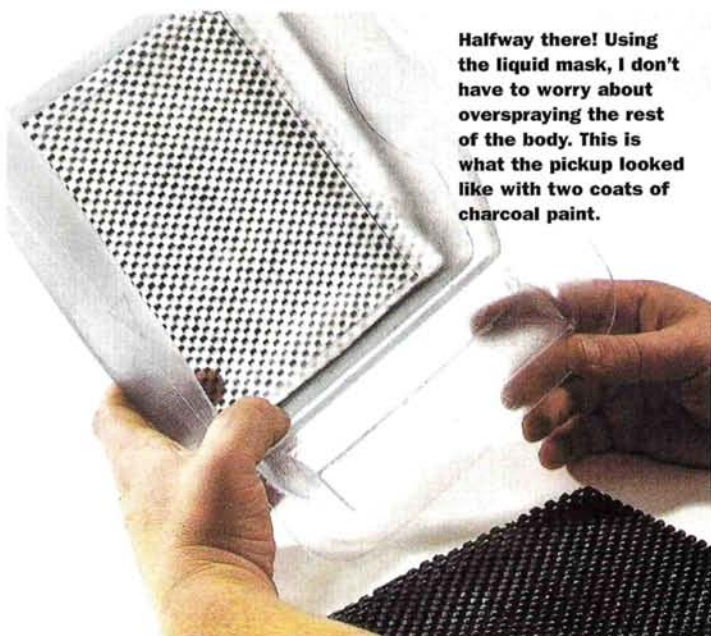
3 Now you're ready to paint. I thin the paint with water until it has the consistency of milk, and I use an Aztek 470 airbrush set at approximately 35psi. Holding the spray nozzle about 6 inches from the surface, spray the mat with an even coat of pearl charcoal. Pay particular attention to the angle at which you spray the mat. You'll want to duplicate this as closely as possible on follow-up coats.

After you've laid down a coat of paint, hit the area with a hair dryer to speed up the drying process. Be careful not to move the liner while the paint is wet, or the results will be very unpleasant. Spray on a total of three coats to ensure even coverage, and be sure to let each coat dry thoroughly.

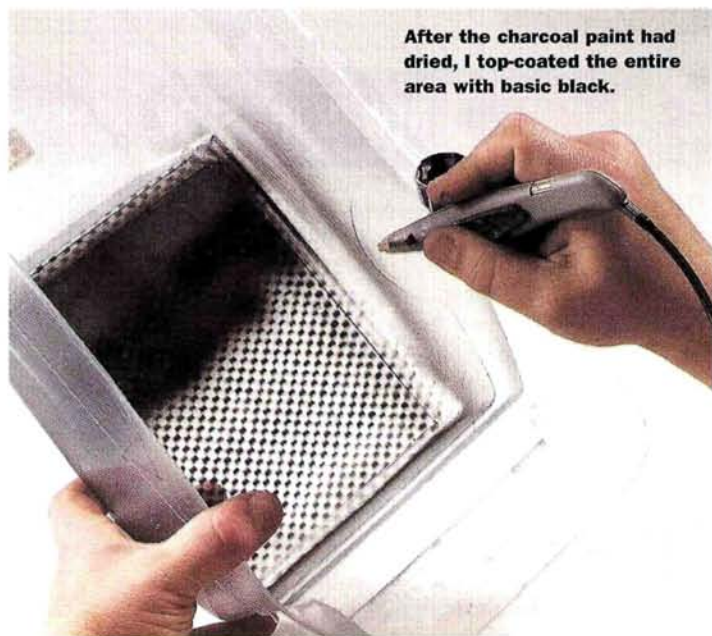


Before you start, make sure that you have everything you need organized and within reach. Here, I've already covered the inside of my HPI Silverado body with two coats of MasterMask, and I have my paint and tools ready to go.

Here's the finished HPI Silverado body. The carbon-fiber effect really dresses up a body, and it's guaranteed to get double-takes. I completed the truck in metallic yellow and added a set of Hobby Tech Python wheels.



Halfway there! Using the liquid mask, I don't have to worry about overspraying the rest of the body. This is what the pickup looked like with two coats of charcoal paint.



After the charcoal paint had dried, I top-coated the entire area with basic black.

4 Remove the liner and set it aside. I save a mat if it has a common size such as the one for the bed. If you laid the paint on evenly, the body should have a mottled pattern, as seen here. Don't sweat it if there's a bleed or two or an area that's a little thin. The black cover coat that you'll apply next will hide any imperfections.

5 Clean your airbrush so that no metallic paint remains in the reservoir or the nozzle, and load up a batch of plain black. Spray the entire area with a solid coat. Dry the paint with the hair dryer, and follow up with another coat of black to be sure that the body is completely covered.

Now, turn the body over and admire your work. Pretty cool, huh? Go ahead and finish painting the body. The subsequent coats won't affect the carbon-fiber areas because they're already opaque. If you want a more graphite look on your model, try substituting pearl black instead of pearl charcoal. This will give the effect of a golden hue rather than gray.



Go ahead and get carried away if you want to. The carbon-fiber effect adds a nice "break-away" accent, too. Here, I'm marking the exterior over-spray film so I'll be able to use it for reference when cutting inside.

Canned carbon fiber

If you don't own an airbrush, you can still try the carbon-fiber technique on your next body using Pactra RC spray cans.

It's best to practice on a piece of clear scrap until you have a feel for how much paint coverage you'll need. Substitute Indy Silver for charcoal and spray on a very light, even coat. Hold the body up to a light after every coat to see how thick your paint coverage is. The silver shouldn't be completely opaque because the effect looks more realistic when some of the black bleeds through; one coat might be enough.

Once you're satisfied with the coverage, remove the mat and hit the area with an even coat of Pactra Outlaw Black. Once this top coat has dried, finish the body.

Though the carbon-fiber effect looks most authentic with the acrylic colors, you can still use spray-can RC lacquers if you want to.



Compare the Pactra RC Acryls I used on the truck with the result I obtained using spray cans. Either way offers a neat dress-up that's easy to accomplish.



NEW IN THE SHOP

Pro-Line Chevy Silverado for Traxxas E-Maxx/T-Maxx

Attention, Maxx owners: Pro-Line has a direct-fit, "bowtie" body for your Traxxas monster. This new crew cab design has nicely detailed vinyl stickers and a textured tonneau cover molded into the bed, too. I airbrushed the flag scheme using Pactra RC acrylic paints and then completed the truck with Pro-Line's Weld Outback wheels and Maxx Masher tires.

- Silverado body—part no. 3100, \$23
- Outback wheels—2656-01, \$15
- Maxx Masher tires—1075-001, \$29



Jesse Brotje of Tallmadge, OH, knows that a hot body doesn't require vast painting knowledge and a million different techniques—only patience and a few spray cans. This is

Jesse's HPI Nitro RS4 RTR, and yes, his Viper is sitting on top of the real deal! Jesse took his time masking the "skunk stripes" and then shot on a couple of even coats of Pactra Candy Blue. After the blue had dried, he removed the stripe's mask and finished the entire body with Sprint White. A set of HPI chrome wheels adds the finishing touch.



Do you have a sharp, uncluttered photo of your best paintwork? Send it in! Explain the types of paint, products and techniques you used to finish it. Be sure to include your full name and address and your email address if you're online. For information about sending electronic images, check out www.caraction.com. Send print or slide photographs to "Body Shop," RC Car Action, 100 East Ridge, Ridgefield, CT 06877, USA.

If you have questions or suggestions about painting techniques, or if there's something you'd like to see in "Body Shop," email me at bobh@airage.com, or send your letters and pictures to:

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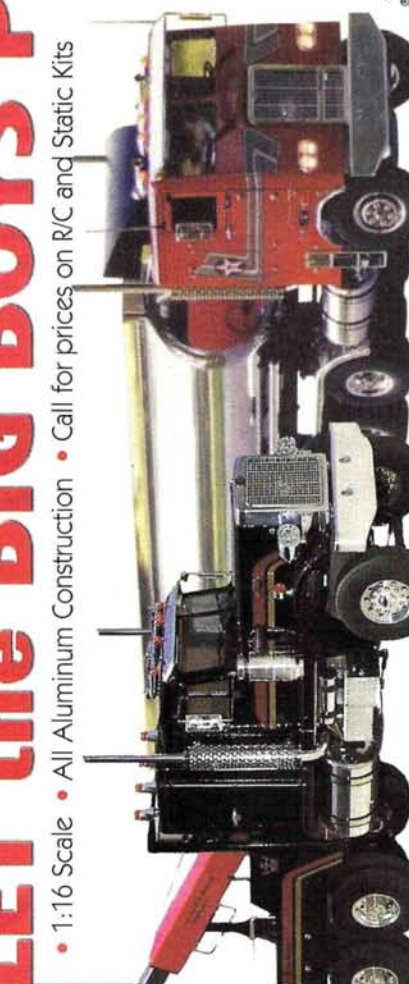
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Chris's BACK LOT

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BY CHRIS CHIANELLI

Cars ... love them all—big & small

Emmanuel Beaufils is not only an RC road-racing fanatic but, because he lives in France, since 1976, he has had the privilege of being right there for the 24-hour Le Mans race every year. He hasn't missed one. How lucky is he?! To me, the most awesome cars ever built raced at Le Mans (I could easily hate this man).

Emmanuel built all the cars you see here to replicate those of the race teams he has become friendly with. I really could hate him! But instead, because he sent us these great photos, I'll arrange for him to receive a free, one-year subscription to *Car Action*.

Just to show I could really never be jealous of a car lover like Emmanuel, I'll also throw in an issue of *Touring Car* and the Buyers' Guide. But watch your step in the future, you lucky Frenchman; I might just have to come over there for a long visit—and that would be your worst nightmare!

The Team Oreca Viper drivers with Emmanuel's Viper. The French are very proud of this team because they won the last 24-hour enduro at Daytona, and they also won the GT2 category in Le Mans. Vive la France! That's right; that's the "Lucky Frenchman" (left) with the team. Look at him gloat.

In downtown Le Mans, there's a hobby shop called "Radio Marquette." During the year, Emmanuel's cars are displayed there with photos of the full-scale ones.

This is driver Jacky Ichxs and a beautiful 1969 GT-40, which is his—another lucky guy.

Is this trust, or what?! Emmanuel's Kyosho Ford GT-40 sits atop Jacky's full-scale. The awesome GT-40s from the '60s have been known to sell for as much as a cool million. That's dollars—not francs.

A 1/10-scale lineup one week before the race.

Emmanuel's Viper with the full-scale cars at the official weigh-in.

Tamiya Porsche 993 GT2—again on top of the full-scale car. T2M, France's Tamiya importer, is one of the sponsors of this car. Emmanuel made the sticker for this Taisan version with his computer.

The Freisinger Porsche driver asked Emmanuel to build their team car in 1/10 scale.